The Aga Khan Award for Architecture

Development and Urban Metamorphosis

Volume II Yemen Background Papers

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Proceedings of Seminar Eight
in the Series
Architectural Transformations in the Islamic World
Held in Sana'a, Yemen Arab Republic
May 25–30, 1983

Published by Concept Media Pte Ltd Singapore,
for the Aga Khan Award for Architecture

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Cover Illustration The City of al-Hajara Yemen Arab Republic. (Photo: C. Little).

Graphics by Viscom Design Associates, Singapore, based upon a concept developed by Herman and Lees Associates, Cambridge, Mass., U.S.A. Printed by Eurasia Press, Singapore.

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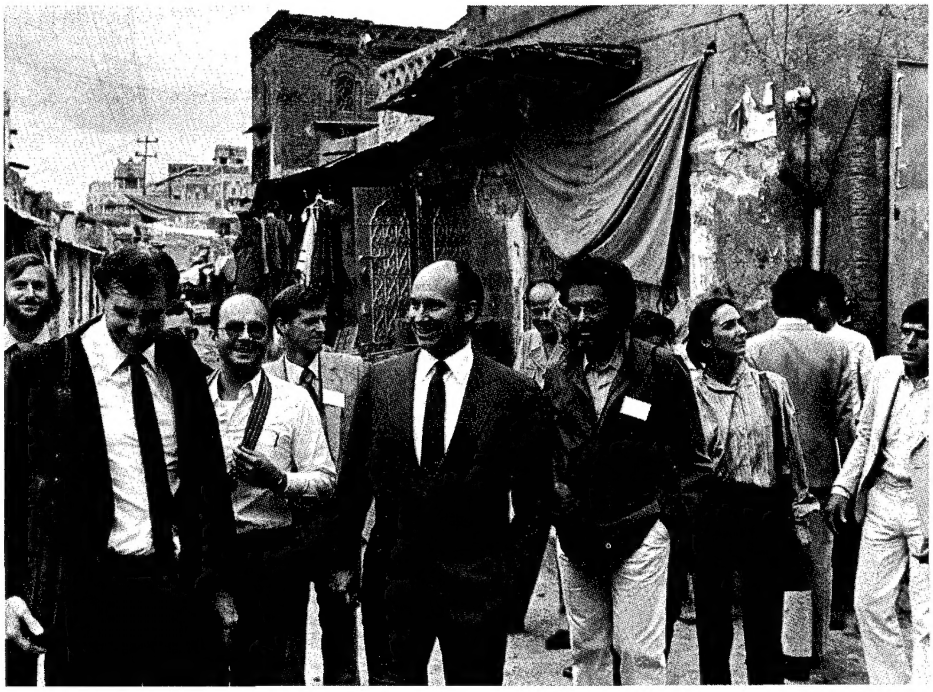
Introduction

Ahmet Evin

The tension between tradition and change has played an integral role in the evolution of societies. This tension between the creative or innovative impulse on the one hand and the sense of comfort human beings find in the security of tradition on the other has profoundly affected the way in which collectivities have transformed their cultural codes, socio-economic patterns and political organisations.

Architecture is the most accurate mirror that reflects the continuity of traditions as well as organic or radical changes in any society. Throughout history human habitats have been undergoing processes of transformation. Concomitant with these transformations, new institutions and functions emerge, and builders and architects then create buildings to accommodate the new institutions and needs. The very evolution of architectural styles is closely connected with socio-economic change: the redistribution of resources in any society results in the formation of new client groups, while the development of building materials' industries and technological advancement enable architects to experiment with new techniques and forms. Architecture is thus related to the social, educational and technological advances more fundamentally than any other art form because a building is first and foremost conceived to fulfill a function rather than to stand as a personal statement in the sense that other art forms can.

It was with the beginning of urbanisation that mankind consciously began to shape a built environment for social and spiritual needs. Cities developed not as a haphazard collection of shelters but as coherent units of dwellings and institutional buildings necessary for the well-being, governance, economic functions and cultural life of the citizens. In the Islamic world, the significance of urbanism was realised early on as the Arabic world *madaniyya* ("pertaining to city") came to denote civilisation. Yet under the pressure of rapid economic and technological changes of our times, many of the old centres of civilisation are faced with the danger of being defaced and ultimately destroyed.



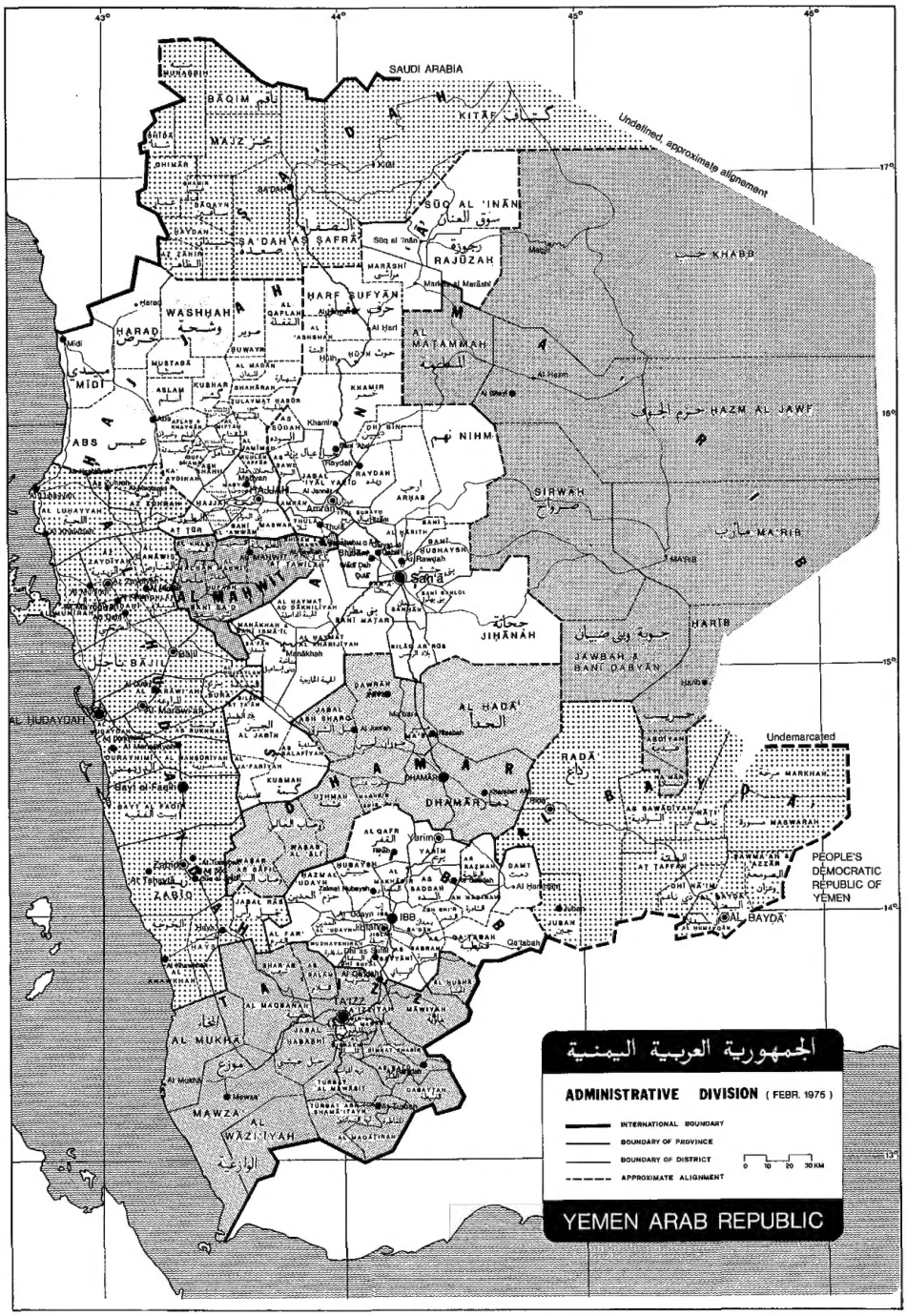
His Highness The Aga Khan with seminar participants in the suq *at Sana'a.*

Photo: C. Little/Aga Khan Awards.

It is with the purpose of examining these broad issues in the specific context of certain significant locations that the Award organised three major seminars during its second cycle. "The Changing Rural Habitat" was the topic of the first of these seminars held in Beijing and followed by site visits to the Province of Xinkiang where the majority of China's Muslims live. In the second international seminar held in Dakar, urbanisation was taken up in the context of the contemporary African city. "The Impact of Development on Architecture and Urbanism" was the theme of the third seminar held in Sana'a, with site visits to several highland towns. This volume, which includes the background papers prepared for this seminar, is the tenth in the series of *Proceedings* by the Award.

The Yemen has provided an extraordinary opportunity to examine the influences of social change, and particularly, of economic development on the traditions of building. It is a unique country whose traditions are deeply-rooted in its long history. Despite its relative physical isolation, the Yemen has been a significant centre of civilisation from the ancient times to the present. As early as the end of the second millenium B.C. the country had an established trade network exporting frankincense and myrrh, and the small "kingdoms" that took rise there had become self-sufficient in agriculture. The origins of the Yemeni art of building go back to the time of these kingdoms when towns were founded and irrigation systems were constructed.

In spite of their predominantly tribal social organisation, the people of Yemen created urban centres early on. The tribal organisation was reinforced by the migra-



Yemen Arab Republic.

Source: Yemen Arab Republic, Central Planning Organisation.

tions and conquests during the Roman times until the advent of Islam in the seventh century A.D. Differentiation along confessional lines, however, continued during the Islamic period, with groups belonging to different sects concentrating in different parts of the country. The Zaydis who came to the Yemen at the end of the ninth century A.D. have settled predominantly in the central and northern highlands, and in the eastern Ma'rib. They now constitute about half the population of the Yemen Arab Republic and continue to cherish their tribal affiliations. The orthodox Shafi'is who, in contradistinction to the Zaydis, gave precedence to agricultural economy and developed a "village-oriented culture" in the southern highlands where they chiefly settled.[1] A significant portion of the population in the coastal Tihama region are African in origin. The thatch houses and wattle fences they build not only point to their East African heritage but are in keeping with the ecology of the area. In the vicinity of Manakha, the mountainous region between Sana'a and the port of Hodeidah, is to be found a community of Ismailis whose origins go back to the Fatimid times. Yemen's "social diversity despite a relative ethnic homogeneity" can also be illustrated by the presence, over a period of a millenium, of a Jewish community whose remnants can still be found in the north.[2]

The Yemeni traditions of building, however, were defined by geographic, ecological, political and economic factors rather than confessional or local-cultural particularism. In the coastal areas can be found traces of cosmopolitanism dating back to the days when port cities such as Mokha and Hodeidah figured in the network of the international maritime trade. Certain architectural styles were also brought to the coastal towns with the Ottoman occupation. Yet it is in the highlands that the truly indigenous forms of Yemeni architecture were developed, utilising local materials and answering the needs of a tribal society. The tall, for-

tress-like residences of the highlands were built to last with materials more permanent than can be found in the lowlands and the coastal plains. A conglomerate consisting of several such buildings constitutes a "small-village" — the urban centre of a tribal entity — and nearly a third of the population of the Yemen Arab Republic live in communities of this size. (Table 1).

It is with the foregoing in mind that the site visits were organised to highland towns, which collectively account for some seventy per cent of the population. Brief descriptions of nine of these towns have been included in this volume to provide a better glimpse into the texture of Yemeni environment.

That environment, however, is changing fast, especially in so far as the built environment is concerned. Whereas modernisation has been a protracted process in most areas of the Middle East, it has begun in the Yemen quite recently, after the revolution of 1962, and has been accelerated by a variety of factors including massive foreign aid and migrant labourer circulation. As such, the Yemeni experience with development has been intense, with all the positive progress and deplorable side effects immediately visible. The redistribution of population as a result of migration to major urban centres leave villages depopulated. Meanwhile serious housing shortage and the lack of adequate means to afford properly constructed residences force the migrants to resort to sub-standard shelters. Infra-structure and services remain inadequate in the face of such rapid expansion of urban centres, notably of the capital Sana'a. As in many other countries, growth means building even at the expense of destroying the existing balanced texture, and efforts toward conservation become difficult and costly. The economic transformation in the Yemen Arab Republic underscores vividly the need to search for solutions towards creating a culturally, ecologically and technologically suitable environment for tomorrow's needs.

Table 1 **Yemen's Population by Size of Settlement, 1975**

Settlement Designation	Number of Inhabitants	Number of Settlements in Category	Percent of Population in Category
City	Over 50,000	3	6.4%
Large Town	10,000 — 50,000	3	1.1%
Medium Town	2,000 — 10,000	45	3.6%
Small Town	1,000 — 2,000	83	2.3%
Large Village	500 — 1,000	600	8.6%
Medium Village	250 — 500	2,000	14.3%
Small Village	100 — 250	9,000	29.6%
Settlement	50 — 100	13,000	19.6%
Small Settlement	Under 50	28,000	14.5%
		52,734	100.0%

Source: Final Report *prepared by the Airphoto Interpretation Team of the Swiss Technical Co-operation Service (Zurich, 1978).*

The emphasis placed upon local development, stemming from the fundamentally decentralised nature of tribal society, is another unique characteristic of the Yemeni political culture. As discussed by two contributors to this volume, the central government distributes a portion of its revenues to Local Development Associations and encourages these associations in their endeavours to initiate, plan, finance and operate various projects that are most relevant to the needs of the communities throughout the country. It is through this kind of effort that developmental schemes can be promoted best, especially in remoter areas, and the specific requirements of a variety of communities can be addressed. The successful functioning of the Local Development Associations and the support given to them by the government exemplify the Yemeni case of national integration based on a tradition of tribal autonomy.

Finally, the Yemen Arab Republic is also unique in the region, a point which clearly emerges in Jim Antoniou's survey. Geologically its terrain is vastly different from any other part of the Arabian peninsula, and as far as climate is concerned, the range is broader in the Yemen than in any neighbouring country. These were perhaps the most important factors that helped create the extraordinary diversity of the Yemeni culture in the past. But today, too, the Yemen remains far apart from its oil-producing neighbours in so far as its economic resources are concerned. Most of the countries of the Arabian peninsula can afford to pay for developmental schemes and act as clients in building for the future. But Yemen can succeed in achieving balanced development through creating its own resources, revitalising its native industries and crafts, and utilising at home its skilled labour.

Reference Notes

[1] David McClintock, "The Yemen Arab Republic," in David E. Long and Bernard Reich, eds., *The Government and Politics of the Middle East and North Africa* (Boulder, Colorado: Westview, 1980), p. 174.

[2] Robert W. Stookey, *Yemen* (Boulder, Colorado: Westview, 1978), p. 183.

The Yemen Arab Republic: Economic Development and Architectural Change

The Aga Khan Program for Islamic Architecture Harvard University and the Massachusetts Institute of Technology

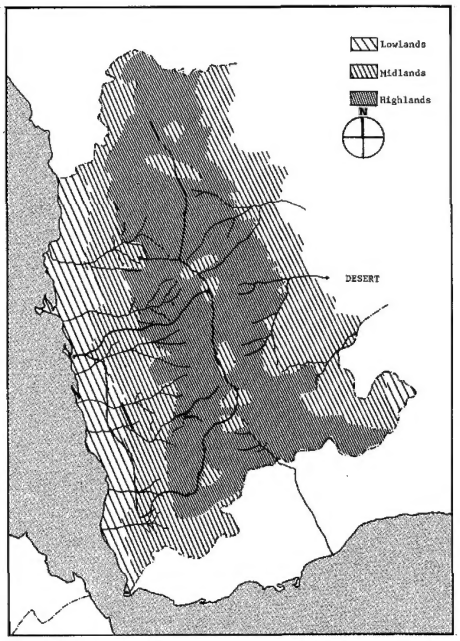
This background paper was prepared for The Aga Khan Award for Architecture by the Office of Special Programs, Aga Khan Program for Islamic Architecture, Mona Serageldin, Coordinator. The research team consisted of James Deemer (history), Joy Hecht (planning), Akhtar Badshah (architecture), Arjun Nagarkatti (architecture) and Ritz Sampat (architecture).

Introduction

The Yemen Arab Republic (North Yemen), a country of about 195,000 square kilometres, is situated at the south-west corner of the Arabian Peninsula: it is bordered to the west by the Red Sea, to the north and east by Saudi Arabia, and to the east and south by the People's Democratic Republic of Yemen (South Yemen). Following the establishment of the republican government in 1962, it has evolved rapidly, and communication with the outside world has increased in importance. Moreover, particularly during the past decade, Yemeni workers have migrated in increasing numbers to Saudi Arabia and other oil-producing countries in the Gulf area seeking lucrative temporary employment, mostly in the construction and service sectors. The combined impact of the sudden opening of the country to the economic and cultural influence of the outside world and the temporary migration of large numbers of workers to Saudi Arabia has been crucial in the development of contemporary Yemen.

Geography

Yemen is dominated by mountain ranges which run from north to south parallel to the Red Sea and rise sharply from sea level to an elevation of 3,700 metres. Several major wadis run down the mountains towards the coastal plains, forming deep narrow gorges which open out as they reach the coast. The eastern slopes of the mountains are more gentle, running into the desert area at the Saudi Arabian border known as the Empty Quarter. The country is comprised of four distinct geographical areas, differentiated by elevation, climate and vegetation, and therefore, by potential for agriculture and urban development.



Yemen Arab Republic, geographical regions.

The coastal lowlands of the Tihama cover an area from 30 to 60 km wide, from Bab al-Mandab in the south all the way into Saudi Arabia. The area begins at sea level and rises in elevation to about 200 m as one moves inland. The land is flat or gently rolling, and is broken by the wide and shallow wadis. Rainfall is very low, and average temperatures vary over the year between about 24°C in winter and 36°C in summer.

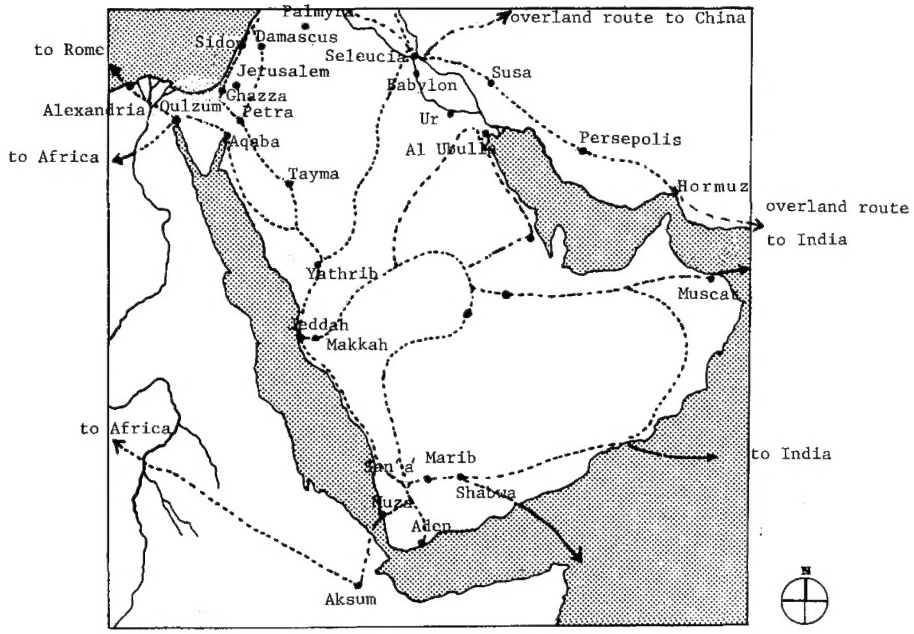
The foothills and midlands are at elevations of 200 to 1500 m, and extend from the Tihama plain east to the highlands. The wadis run through narrow gorges, and the mountains are steep and rugged, making communication between settlements difficult. In lower areas, annual rainfall averages about 400 mm, and is heaviest in August. With altitude it increases to 600 mm, falling in two peak seasons, April-May and July-September.

The central highlands reach elevations of 1500 to 3700 metres. Annual rainfall is heaviest in the agricultural southern end of the region, at over 1000 mm. It drops off to the north, to 300 mm in the central city of Sana'a and 200 mm near the Saudi border. High plateaus, at elevations above 2000 metres, mark the break between the rugged mountains to the west and the smooth slopes to the east. At the southern end temperatures average in the low twenties in the winter months and the high twenties in the summer; they are a few degrees cooler further north.

The eastern plateau slopes gradually down from the highlands, dropping to an elevation of 1000 metres. Although no measured metereological data are available for this region, it is known to have very low rainfall, and is considered a semi-desert. It joins the Great Arabian Desert at the eastern border of the country.

History

The early history of the Yemen is extremely vague. It is not until the rise of the Sabaean Kingdom in the eighth or ninth century B.C. that some clearer historical information begins to emerge, but, though the Sabaeans represent the point in ancient Yemeni history when some sort of centralised, urban-based political authority came into existence, international trade involving the Yemen far pre-dates their rise. The Egyptians, in particular, were interested in southwest Arabia because of the frankincense produced there and the role the area played as a transit point in sea trade with Mesopotamia, Persia and India. Political organisation in the Yemen prior to the



Trade routes in the Middle East.

Sabaeans probably never advanced much beyond the level of tribal confederations geared to the production and export of frankincense.

When the Sabaeans, a tribal group originally from the area of Najran, took power in the Yemen and the Hadramawt, they united the pre-existing tribal confederations under a centralised administration. They created a hierarchical feudal system whereby the state was divided into districts called *mihfad*, ruled by a feudal lord referred to as *dhu*, or master of that particular district. A group of districts fell under the authority of a *qayl* and constituted a province, *mikhlaf*. Since this hierarchical system was superimposed upon the tribal order, whenever the central authority weakened, the lower levels tended naturally to slip back to the older tribalism. This pattern of fluctuation between centralised authority and local autonomy would continue throughout the history of Yemen.

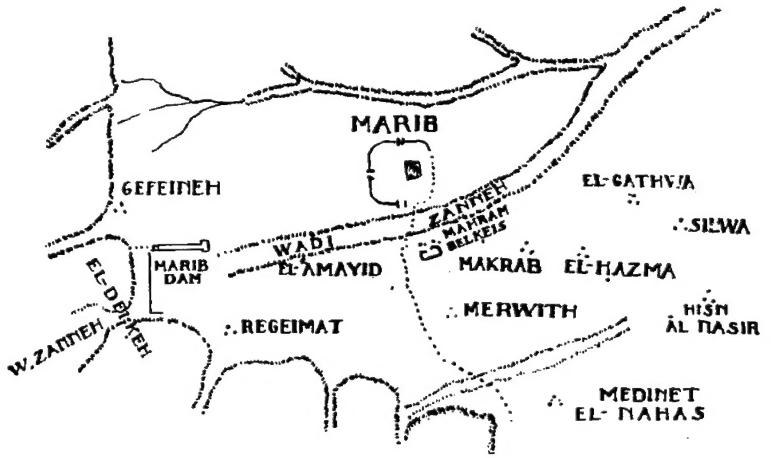
At first, the kingdom was headed by a priest-king, whose seat of power was at Sirwah, west of Ma'rib, where the ruins of the city and the temple of the moon god Almaqah can still be seen. A secular ruler replaced the priest-king around the end of the seventh century B.C., and the capital was transferred to Ma'rib, 100 kilometres east of Sana'a. Ma'rib was significant for several reasons.

Located inland and over 1000 metres above sea level, it was relatively inaccessible to foreign invaders, a topographical advantage which was supported by the construction of several military fortresses. Ma'rib was also the point of intersection of the trade routes attached to the frankincense-producing areas of the Hadramawt and those leading northward to the Mediterranean ports, most notably Ghazza. The Sabaeans constructed at Ma'rib a great dam across the Wadi Saba', stimulating sedentarised agricultural development in the area, as well as eliminating the possibility of destructive flooding.

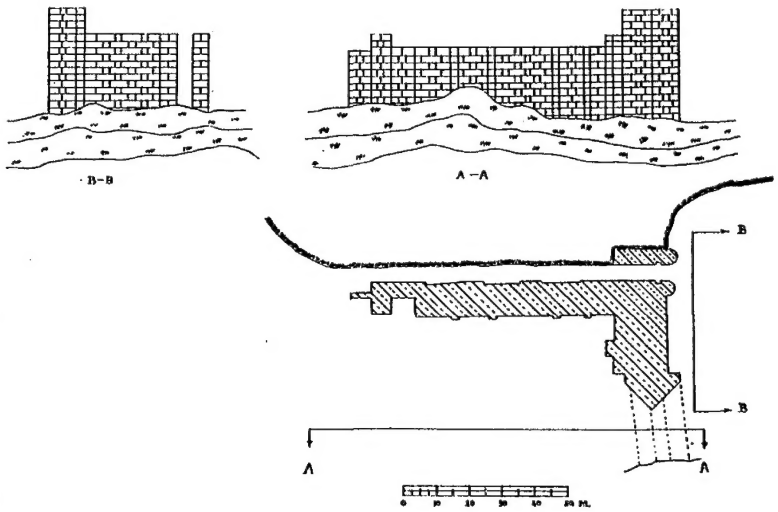
Contemporaneous to the Sabaeans, and often falling under their political control, were three secondary states, the most notable of which was the Minaean Kingdom. The two most important Minaean cities were their capital of Qarnaw (modern Ma'in) and their religious centre of Yathil, northwest of Ma'rib. The second, the Hadramawt Kingdom, which began in the fifth century B.C. and continued intermittently until the end of the first century A.D., had its capital at Shabwa, an important cross-roads of the routes bringing frankincense northward out of the Hadramawt.

Finally, the short-lived fifth-century B.C. Qataban state of the area immediately east of present-day Aden had its capital Tamna' where, among the ruins, can be seen the temple of the sun god Ashtar. It is difficult to determine the relationships which these four groups maintained with one another; however, it would appear that close commercial co-operation generally existed, and that at least until the third century B.C. the Sabaeans were the region's dominant force.

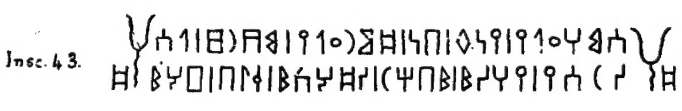
The Sabaeans, whose primary power base was in international trade, built an extensive network of roads, warehouses and watch-towers which extended well into northern Hijaz. They built a royal residential complex at Shabwa during a period when they held ascendency over the Hadramawt Kingdom. During the third century B.C., the centralised Sabaean administration began to disintegrate and, in 115 B.C., the Banu Himyar, a military branch of the greater Sabaean tribe, took power and reunited much of the Yemen, absorbing the remnants of the Minaean Kingdom as well. With the exception of a brief interregnum of Abyssinian domination during the fourth century A.D., the Himyarites would rule over the region until the beginning of the sixth century A.D. The Himyarites built a new capital at Zafar, 150 km north-east of Mokha on the road to Sana'a, on top of a large circular hill. Security against bedouin raids was a consideration which went into the design of almost all Himyarite architecture.



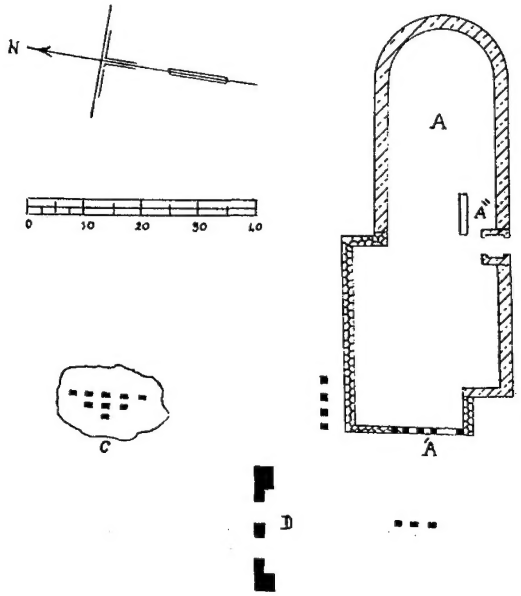
Map of Sabaean Marib showing the Palace Enclosure, the Temple of Balkeis and the Great Dam.



Plan/section of the South Sluice Gate of the Marib Dam.



Inscription recording the foundation of the Southern Sluice Gate.



Sketch Plan of some of the Ruins at Sirwah.

Source: Ahmad Fakhry, Archaeological Journey to Yemen, *Vol. 1, pp. 31, 66, 84 and 96.*

It is difficult to reconstruct the physical plans of any of the early Yemeni cities, for they have disappeared without leaving an imprint on the existing urban centres, which acquired their current forms during the Islamic period. The Himyarites were largely responsible for converting the Yemen into what Yaqut called "the land of castles". The most impressive of their citadels was Qasr Ghumdan at Sana'a, dating probably to the first century A.D. The completion of this *qasr* marked the transfer of the royal court from Zafar to Sana'a. Vivid descriptions of the scale and grandeur of this palace are provided by al-Hamdani and Yaqut, but it has since disappeared.

During the later Ptolemaic period, Roman and Egyptian navigators discovered the regularities of the monsoons and were able to break the Yemeni monopoly over international maritime trade. The Himyarite Kingdom contracted, and was briefly occupied during the fourth century A.D. by the Abyssinians, but the restored kingdom was never able to duplicate the glory of the first.

Judaism and Christianity began to spread into south-western Arabia at about this time. Jewish colonies appeared throughout the region and rapidly increased in both numbers and influence, to the degree that the last Himyarite ruler, Dhu Nawas, found it expedient to convert to Judaism. Simultaneously, important Monophysite Christian centres grew at Najran in the north and 'Adan in the west. Competition and political tension grew between the Jewish and Christian groups. Continuing threats of an Abyssinian Christian invasion finally prompted Dhu Nawas to launch a campaign of persecution against the Christians and send an expedition to destroy the church at Najran. This event, referred to in the Holy Qur'an (85: 4-8), resulted in a large-scale Abyssinian invasion in 523 A.D., and for fifty years Yemen remained under their control.

The third Abyssinian viceroy Abraha made Sana'a his capital, where he built a magnificent cathedral, known as al-Qalis, using stones taken from the ruins of the Sabaean city of Ma'rib. Pilgrimage to the church brought great wealth to Sana'a and increased the influence of Abraha's government among the bedouin tribes of the region. In 570-71, Abraha launced a military campaign against Mecca which ended in failure. This defeat is mentioned in the Holy Qur'an (105: 1-3). At about the same time, the neglected dam at Ma'rib burst, symbolising the culmination of the process of internal decline which had been taking place in Yemen during the previous three hundred years. This is also mentioned in the Holy Qur'an (34: 15-20).

In 575, Sasanians sent an expedition to assist a descendant of the old Himyarite dynasty, Sayf ibn Dhi Yazan, in ousting the Abyssinians. This victory made Dhi Yazan an everlasting hero of Arabic literature and folk tales. The defeated Abyssinians were decimated. However, upon Dhi Yazan's death, nominal Himyarite rulers continued to reside in Sana'a, but in reality the Yemen was governed as a Persian satrapy. In 628 A.D. the Persian governor of Yemen, Bazan, embraced Islam, which had by that time emerged as the primary religious and political force in the Arabian Peninsula.

Many important Yemeni tribes converted to Islam during the lifetime of the Prophet, but after his death some abandoned the faith and, during the Ridda Wars, the Caliph Abu Bakr sent a force to recover the Yemen. Thereafter, the Yemen would remain in the Islamic *umma*.

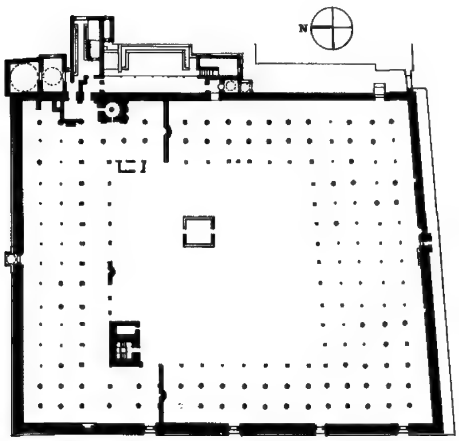
During the early Islamic period, under the Orthodox Caliphs, Yemen was a very important province, supplying abundant natural resources and income, manpower for the armies, leaders for the government and the military, and settlers for Muslim cities. Large Yemeni contingents were among the population of the new garrison cities, *amsar*, such as Basra, Kufa and Fustat, and as many as 27,000 Yemenis are said to have settled in Alexandria. But, with the shift in the political focus of the Islamic state out of the Hijaz to the new capitals of Damascus, Baghdad, Cairo and finally Istanbul, the Yemen came to occupy an increasingly peripheral position with respect to central political authority and imperial urban culture.

During the Umayyad period, the Yemen was divided into two administrative districts, the northern one centred at Sana'a and the southern, which included the Hadramawt, at Janad. The governors of Yemen tended to rule with a good deal of political autonomy as long as tax obligations were met. Meanwhile, various Shiite groups were beginning to build up power bases within Yemen. There were continuous challenges to Umayyad and early Abbasid rule, including several major popular uprisings against the governors.

Finally, in 822, the Abbasid governor Muhammad 'Abd-Allah ibn Ziyad broke away in all but name from Baghdad, establishing the new city of Zabid as his capital. The regional unity of Yemen quickly disintegrated. The north became a haven for various Shiite groups, the most important of which were followers of 'Ali Zayn al-'Abidin, who came to Yemen from East Africa. A Himyarite revival took place in the central highlands, and other tribal groups exercised autonomous control over local areas. This sort of fragmentation would characterise the general political state of affairs of Yemen until the thirteenth century.

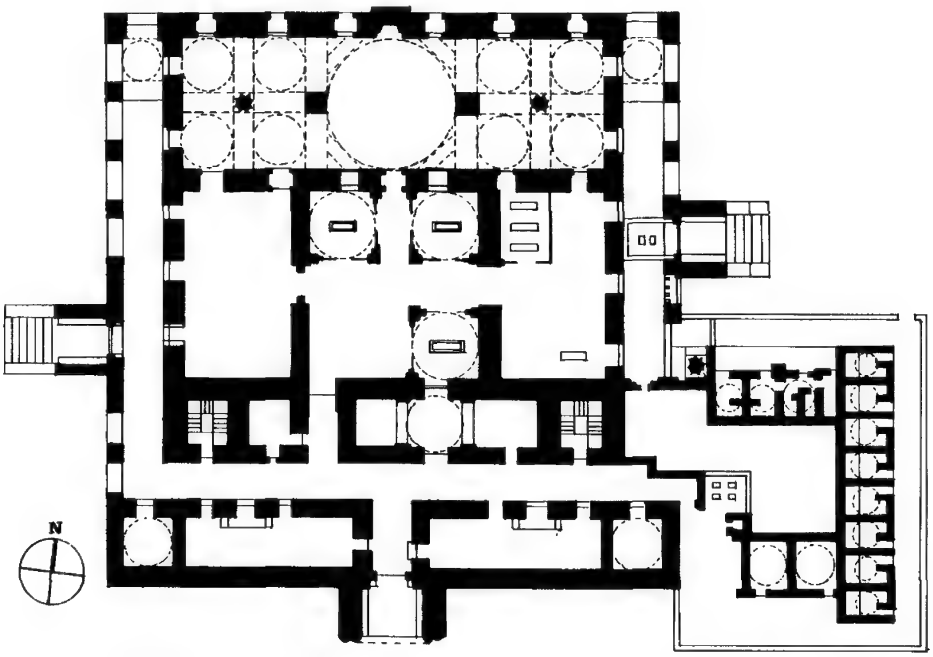
Towards the end of the ninth century, Yemen became a base of operations for the Fatimid Shiism, which met with a good measure of success there. But in the early tenth century the focus of the movement shifted to North Africa, and the Yemeni groups lost much of their importance.

Their primary rivals were the supporters of the Zaydi Imams, based around Najran and Sa'ada. Battles between the two groups were continual, with nume-



Sana'a, Great Mosque of the Rasulid period, 13th and 14th centuries.

Source: George Michell, Architecture of the Islamic World, *p. 210.*



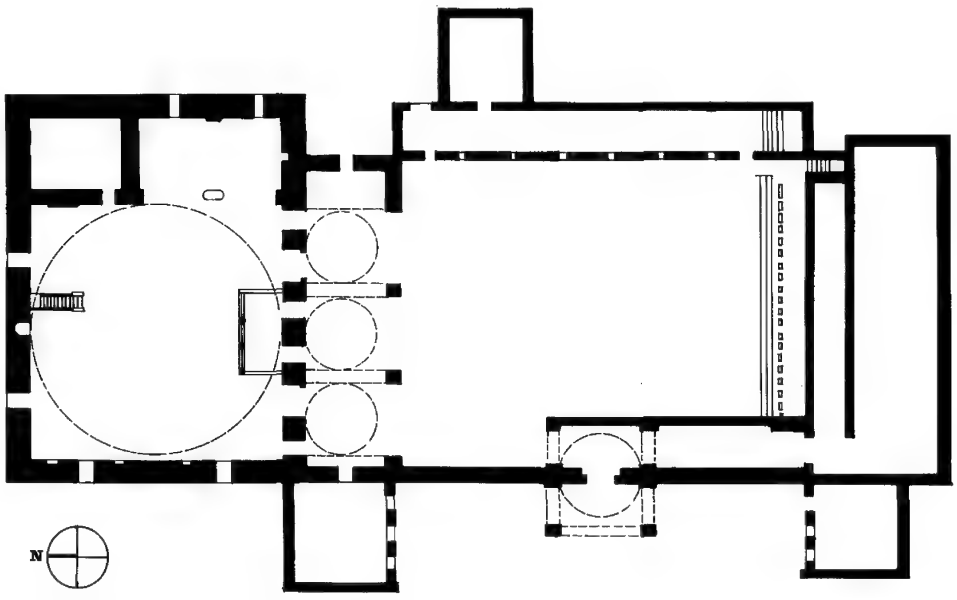
Ta'izz, Ashrafiyya Mosque, 7th-17th centuries.

Source: George Michell, Architecture of the Islamic World, *p. 211.*

rous local dynasties and tribal chiefs taking one or the other side. By the middle of the twelfth century, the Fatimids had been largely eliminated, and Yemen emerged from the struggles of the previous two centuries, divided into five major states, each with its minor vassals and dependents.

Political reunification began with the Ayyubid conquest in 1173, and the subsequent transfer of power to the Rasulid dynasty, who had been their allies. For a brief period during the thirteenth century, the Rasulids governed a united Yemen which extended from southern Hijaz to the Hadramawt. From their capital, Sana'a, they continued to rule over most of the region until the mid-fifteenth century, with serious opposition from the Zaydis in the Najran-Sa'ada area and the Sharifs of the Tihama region.

The Mamluks of Egypt and the Ottoman Turks successively launched campaigns into the Yemen during the first half of the sixteenth century. Both managed to occupy the coastal Tihama region, but failed to establish full control over the interior of the country. Their authority was never accepted by the people and



Sana'a, Mosque of al-Bakiriyya, Ottoman period, 1597.

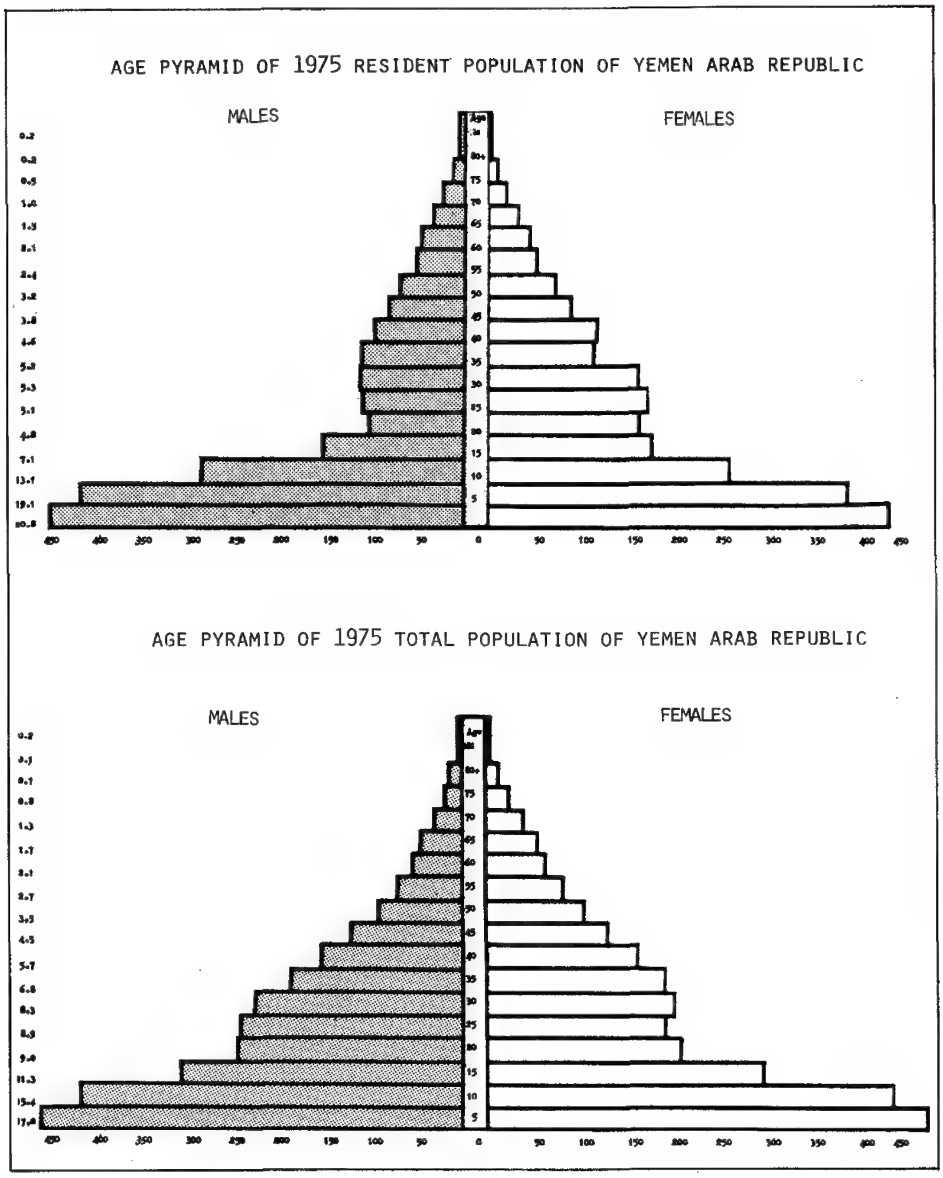
Source: George Michell, Architecture of the Islamic World, *p. 211.*

leaders of Yemen, and they were eventually forced to withdraw. By 1547, the Ottomans were able to extend sufficient control over the interior to allow them to remain in the area until 1635, when they were finally expelled. The Yemen again reverted to a state of general political fragmentation with varying degrees of unity achieved by successive rulers of the Zaydi dynasty of al-Qasim, whose capital was at Sana'a.

The Ottomans returned to the Yemen in 1848 and managed to re-take the interior by 1872, only to withdraw once again in 1918 after their defeat in World War I. Their departure left much of the country under the authority of the Zaydi Imam Yahya. Meanwhile, the British had established a strong presence in the south and the Hadramawt, and the followers of 'Abd al-'Aziz al-Sa'ud were entering the Najran region from Najd. This critical situation led Imam Yahya to accept a treaty with the British in 1934, only to abrogate it within months in favour of the Treaty of Muslim Friendship and Arab Fraternity, which formed the basis for continued friendly relations with the Kingdom of Saudi Arabia.

In 1962 a republic was declared in Yemen. There ensued eight years of civil war between the Republican forces and the Royalist supporters of the deposed Imam. In 1970 a constitution was promulgated, and a new republican government established. Remaining opposition was defused by integrating its leadership within the new administrative structure. The country is now ruled by a Constituent People's Assembly, which elects the president.

The political history of the 1970s has been dominated by efforts to strengthen the central authorities and to work towards agreement between the North and South Yemen.



Population Chart.

Source: Yemen Arab Republic, Statistical Yearbook 1981.

Demographic Characteristics

Data on the population of Yemen come from two sources. For 1975, detailed information on demographic characteristics and geographical distribution of population are available from the Population and Housing Census. For 1981, summary population data are available from the Confederation of Yemen Development Associations. Detailed breakdowns from the second census have not yet been published.

The total population of the Yemen Arab Republic was given by the 1975 census as 6,492,530. That number included 1,234,000 people who were then working outside the country.[1] By 1981, these figures had risen to 8,540,119 and 1,394,778, according to the census taken by the Confederation of Yemen Development Associations (CYDA). However, these statistics indicate an annual growth rate of 6 per cent, so it would appear that either the 1975 census underestimated the resident population or that the CYDA counts are too high. Whatever the case, it is clear that the number of migrant workers is levelling off.

The distribution of population between urban and rural areas show the effects of both internal and external migration. In general, men are moving from rural areas and small towns either to larger towns and cities, or abroad. Thus the 1975 census showed an overall male:female ratio for the country of .91, whereas it was well over 1.0 in four of the five largest cities (see Table 2). Although growing, the seven largest cities, which account for 75 per cent of the urban population, still represent less than 10 per cent of the total resident population.

There are no exact data on vital statistics in Yemen; official records of births and deaths are not kept and many people do not know their exact ages. On the basis of the 1975 census and supplementary sample surveys, the Population Centre (an agency of the Central Planning Organisation) estimated the natural population increase at about 2 per cent per annum. This was derived from a birth rate of 46 per 1000 and a death rate of 27 per 1000.[2] This growth rate estimate was subsequently raised to 2.5 per cent, but it still seems too low even when allowance is made for an over-estimate in the CYDA census of 1981. A growth rate of 3.4 per cent is suggested in the Second Five Year Plan (1982-1986).[3] Although population growth is not perceived as a problem now, it could be a problem in the coming decades, as the death rate declines with improved medical care.

Education levels in Yemen are very low. According to the 1975 census, 82.6 per cent of the population (65 per cent of males and 97.3 per cent of females) ten years and older were illiterate. Statistics from the 1981 census show enrollment in primary schools in 1980-81 at 34 per cent of population in the corresponding age group, enrollment in preparatory school at about 4 per cent, and in secondary school at less than 3 per cent (see Table 3). Enrollments in the latter two cycles are expected to grow following improvements in attendance at the primary level.

Table 1 **Population Estimate, 1975-1981**

	1975 Census	1981 CYDA Census
Resident population	4,540,230	6,439,363
Population of uncovered areas*	294,500	
Population unenumerated	423,800	705,978
Yemenis outside the country	1,234,000	1,394,778
Total	6,492,530	8,540,119

**Geographical areas which could not be reached by the census takers. Populations were estimated using aerial photography.*

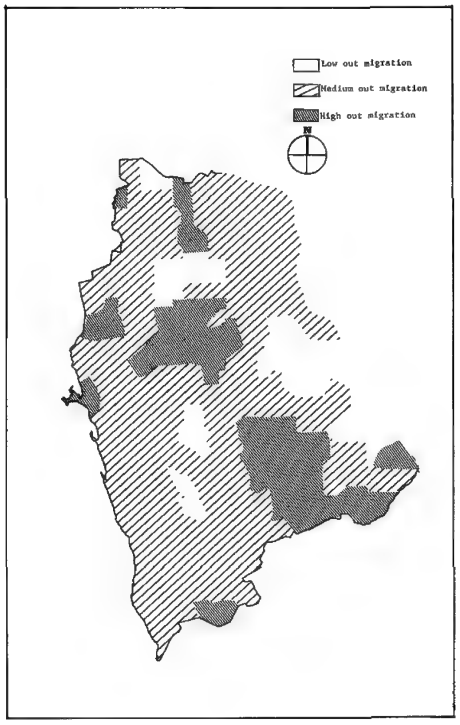
Table 2 **Population of Major Urban Centres, 1975**

	Population (1975)	Per Cent of Total	M:F Ratio*
Sana'a	135,625	3	1.33
Ta'izz	79,720	2	1.27
Hodeida	72,895	2	1.37
Ibb	17,496	—	1.10
Dhamar	19,540	—	.94
Total, 5 largest cities	325,276	7	1.23
Total resident population	4,540,278	100	.91

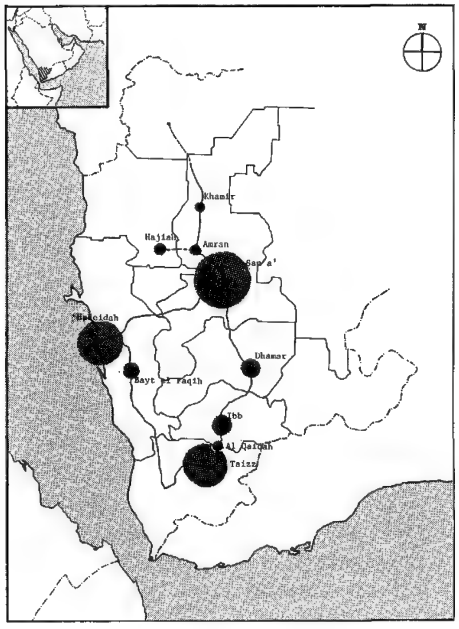
**Source: World Bank,* Yemen Arab Republic: Urban Sector Report. *World Bank Report No. 2699-YAR (Washington, D.C., March 1981).*

Economy

Prior to 1970, communication within the Yemen was difficult, external trade was very low, and agriculture accounted for nearly half of the domestic product. In the past decade, the migration of labour to oil-producing countries and the establishment of a government specifically interested in development have generated rapid change in Yemen's income and economic structure. With an estimated doubling of real per capita GNP to $390 in 1976/77,[4] physical and economic conditions have improved, but a host of new problems have arisen.



Migration patterns in the Yemen Arab Republic.



Major urban centres.

Table 3 **School Enrollment**

	Enrollment 1980/81	M:F Ratio	Per Cent of Population in Corresponding Age Group
Primary (Ages 6-11)	412,573	7.10	34
Preparatory (Ages 12-14)	19,037	4.82	4
Secondary (Ages 15-18)	9,815	6.94	3

Table 4a **Gross Domestic Products at Market Prices, by Sectors, 1971/72-1981**
(at constant prices of 75/76, in millions of riyals)

Kind of Economic Activities	71/72	73/74	75/76	77/78	80/81	1981*
1. Industries:						
Agriculture, forestry & fishing	1550	1661	1850	1653	2111	2177
Mining & quarrying	27	35	32	64	74	75
Manufacturing	159	221	257	309	448	460
Electricity, gas & water	8	12	17	22	43	46
Construction	170	205	283	511	469	481
Wholesale & retail trade	475	751	948	987	1059	1032
Restaurants & hotels	44	54	64	72	83	84
Transport & communications	116	132	150	200	217	220
Financial institutions	47	77	141	338	448	452
Real estate and business services	170	201	207	221	265	272
Community, social & personal services	28	36	42	52	63	64
Sub-Total	2794	3385	4152	4429	5280	5363
Less: Imputed bank services charge	−51	−72	−134	−305	−418	−422
Sub-Total	2743	3313	4018	4124	4862	4941
2. Producers of government services	340	397	509	585	833	885
3. Producers of private, non-profit services to households	10	12	14	19	24	24
4. Import duties	222	266	394	887	836	785
Total	3315	3988	4935	5615	6555	6635

**Provisional*

Table 4b **The Structure of Gross Domestic Product at Market Prices by Sectors, 1971/72-1981**
(at constant prices of 75/76, in millions of riyals)

Kind of Economic Activities	71/72	73/74	75/76	77/78	80/81	1981*
1. Industries:						
Agriculture, forestry & fishing	46.8	41.7	40.8	29.4	32.2	32.8
Mining & quarrying	0.8	0.9	0.6	1.1	1.1	1.1
Manufacturing	4.8	5.5	5.2	5.5	6.8	6.9
Electricity, gas & water	0.2	0.3	0.3	0.4	0.7	0.7
Construction	5.1	5.1	5.7	9.1	7.2	7.2
Wholesale & retail trade	14.3	18.8	19.2	17.6	16.1	15.6
Restaurants & hotels	1.3	1.4	1.3	1.3	1.3	1.3
Transport & communication	3.5	3.3	3.0	3.6	3.3	3.3
Financial institutions	1.4	1.9	2.9	6.0	6.8	6.8
Real estate and business services	5.1	5.0	4.2	3.9	4.0	4.1
Community, social & personal services	0.9	0.9	0.9	0.9	1.0	1.0
Sub-Total	84.2	84.8	84.1	78.8	80.5	80.8
Less: Imputed bank services charge	−1.5	−1.8	−2.7	−5.4	−6.3	−6.3
2. Producers of government services	10.3	10.0	10.3	10.4	12.7	13.3
3. Producers of private, non-profit services to households	0.3	0.3	0.3	0.4	0.4	0.4
4. Import duties	6.7	6.7	8.0	15.8	12.7	11.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

**Provisional*

Table 5 **Employment Structure** (in thousands of workers)

	1975/76	%	1980/81	%
Agriculture	830.6	75.4	830.4	69.1
Extractive Industries	0.6	0.1	1.3	0.1
Manufacturing	33.9	3.1	52.9	4.5
Utilities	1.5	0.1	3.9	0.3
Construction	52.5	4.8	72.0	6.0
Trade	69.0	6.3	71.1	5.9
Transport	24.7	2.2	31.6	2.6
Finance	2.0	0.2	4.5	0.4
Government Services	85.8	7.8	133.9	11.1
Total Resident Labour Force	1,100.4	100.0	1,201.6	100.0

Source: YAR Central Planning Organisation, Second Five-Year Plan, 1982-1986 *(Sana'a, 1982), p. 18.*

Table 6 **Index for Wages and Salaries, 1975/76-1980/81**

Year	Index of average wages and salaries
1975/76	100.0
1976/77	124.8
1977/78	188.3
1978/79	254.6
1979/80	307.0
1980/81	319.1

Source: YAR Central Planning Organisation, Second Five-Year Plan, *1982-1986 (Sana'a, 1982), p. 19.*

Labour migration to the oil-producing countries has had perhaps the most dramatic impact. An estimated 30 per cent of Yemen's male labour force are employed abroad at any one time.[5] Their greatly increased earnings, saved or sent home to their families, have generated vast increases in consumer demand which cannot be met at current levels of production capacity. This has caused serious shortages, and has contributed to an inflation rate which has averaged 30 per cent per annum. At the same time, public investment in infra-structure of all kinds has been increasing, with projects to build roads, expand ports, provide electricity, develop water and sewer systems, improve education and health services, and so on. The combination of labour migration, industrialisation, and increased public investment has resulted in domestic labour shortages. This has created a problem for the government, which is unable to respond as quickly as the private sector with increased wages and therefore cannot compete effectively for skilled workers.

Table 4 shows the growth and sectoral break-down of gross domestic product from 1970/71 to 1981. Total product nearly doubled, with most of the growth occurring in the modern sectors of manufacturing, construction, financial institutions, and electricity. At the same time the share of agriculture dropped sharply, which is typical of developing economies.

Table 7 **Capital Formation Finance during the first Five-Year Plan** (millions of Riyals)

	76/77	77/78	78/79	79/80	80/81	Total
Gross Capital Formation	1,391	3,567	4,475	5,237	5,520	20,190
Domestic Savings	−1,836	−674	−1,825	−2,425	−2,721	−9,481
Net Foreign Factor Income	994	1,332	1,743	2,160	1,855	8,128
Net Foreign Current Transfers	3,450	4,382	3,936	4,022	3,362	19,192
Total Savings	2,648	5,040	3,854	3,757	2,540	17,839
Net Foreign Capital Transfer	54	200	453	169	(234)	632
Net Foreign Borrowing	1,311	1,673	(168)	(1,311)	(3,214)	(1,709)
Gross Domestic Product	6,478	8,220	10,166	11,919	12,629	49,421
Domestic Savings as Percent of G.D.P.	(28.3)	(8.2)	(18)	(20.3)	(21.5)	(19.2)
Final Consumption (public & private)	8,323	8,894	11,991	14,344	15,350	58,902
Consumption as Percent of G.D.P.	128.3	108.2	118.0	120.3	121.5	119.2

Source: YAR Central Planning Organisation, Second Five-Year Plan, 1982-1986 *(Sana'a, 1982), p. 25*

The results of the First Five-Year Plan show corresponding shifts in the sectoral distribution of employment between 1975/76 and 1980/81 (Table 5). They also show dramatic increases in wage and salary levels in response to the labour shortages, from a base of 100 in 1975/76 to 319.1 in 1980/81 (Table 6), while per capita GNP rose from $380 to $450.[6]

However, the statistics suggest that this unprecedented growth may be tapering off. The overall growth rate of the GDP peaked at 11 per cent between 1974/75 and 1975/76, and the changes in sector shares of output slowed down after 1978. This corresponds to a decrease in the nominal level of remittances after 1978. In part this drop may be attributable to a narrowing of the gap between wages of unskilled labourers in urban Yemen and Saudi Arabia. Demand for Yemeni workers abroad may also have decreased as waves of new workers have reached Saudi Arabia from Pakistan, Korea and elsewhere. Although the remittances help the Yemeni economy, the resultant labour shortages are difficult to contend with, and there are differences of opinion within the country as to encouraging or discouraging migration.

This points to a key feature of Yemen's economic expansion, that it is based almost entirely on capital flows from abroad rather than on increases in domestic productive capacity. Table 7 shows the growth of the GDP and expenditures from 1976 to 1981, and gives levels of foreign finance from workers' remittances and other sources. Over the five years an average of 80 per cent of public and private consumption expenditures were financed with foreign income, of which 58 per cent came from remittances. This fact is recognised by the Central Planning Organisation which seeks to build up local production in both the agricultural and manufacturing sectors during the Second Five-Year Plan. The stabilization of the demand for expatriate Yemeni labour places even greater urgency on domestic economic development.

A large proportion of the remittance money is going into investment in housing. This may be due in part to a traditional Yemeni distrust of impersonal financial institutions. To a greater extent, it is due to the basic desire to have a house of one's own and the prevailing high rates of inflation which make real estate an attractive investment. It has resulted in rapid increases in the cost of house construction, both through higher prices of building materials and higher wages. One outcome has been a shift to the use of imported materials and away from labour-intensive traditional construction technologies.

There are no direct data on the impact of the remittances on income distribution. Some general trends can be predicted, however. The migrant workers come, by and large, from poor rural areas. They place a high value on traditional family ties, and it would appear that much of their increased wealth ends up being distributed among their relatives in the form of housing, investment in equipment to increase agricultural output, and consumer goods. The supply shortages and consequent price inflation, however, are benefitting a limited segment of manufacturers and merchants who, at least in the short run, are reaping windfall profits. Additional demand is also leading farmers to switch from growing food and export crops to growing the more lucrative *qat*, a plant whose leaves are chewed for a mild stimulant they contain.

Urban Growth and Development

Before the revolution of 1962 and the economic boom of the 1970s, Yemeni towns served only as regional market centres for their agricultural hinterlands. Since then the few largest cities have witnessed considerable expansion; however, the country is still overwhelmingly agricultural, as Table 8 shows.

Table 8 **Urban Population, 1975**

	1975 Census	STCS Estimate*
Cities over 10,000 Residents:		
Sana'a	135,625	138,625
Hodeidah	72,895	82,724
Ta'izz	79,720	81,001
Dhamar	19,540	20,051
Ibb	17,496	19,638
Bayt al-Faqih	12,033	12,703
Al-Bayda'	10,419	n.a.
Sub-total	347,728	354,742
46 Towns, 2,000-10,000	166,504	169,645
83 Towns, 1,000-2,000	n.a.	110,026
600 Villages, 500-1,000	n.a.	403,098
Rural Areas (under 500)	n.a.	3,680,508

*Estimates prepared for the Yemen Arab Republic by the Swiss Technical Co-operation Service, using aerial photography and house counts.

Source: World Bank, Yemen Arab Republic: Urban Sector Report *(Washington, D.C., March 1981), pp. 4-5.*

Physical Conditions

The major cities are only beginning to respond to population increases. By and large infra-structure is non-existent. The most glaring lack is paved roads; in the three largest cities only the major streets are surfaced, and heavy rainfalls combined with dense traffic cause severe damage to the roads. The road problems are compounded by the lack of any system for drainage of storm water and inadequate traffic regulation. Traffic congestion is a problem despite the fact that few people own vehicles, and most of the limited public transportation is provided by privately organised jitney and taxi services.

Water and sewer systems are severely lacking in all Yemeni cities. About 50 per cent of the combined populations of Sana'a, Hodeidah and Ta'izz have piped water. Other people rely on surface wells or water vendors. None of the cities has an operating sewer system, though in all three these are under construction or in planning. In the absence of sewers, most urban areas rely on septic tanks, cesspools or soakage pits. This causes high levels of ground-water pollution, a serious problem where drinking water comes from wells. The National Water and Sewerage Authority, founded in 1973, is responsible for seeking solutions to these problems, although work is just beginning.

Demand for electricity far exceeds supply in all three of the major cities. This, combined with recent increases in productive capacity, has given rise to a thriving black market. Table 9 gives World Bank estimates of the proportion of households served in four major cities. Households without electricity have to rely on kerosene, which at average usage levels costs more per month than electricity. Initial connections, which cost $150 at official rates, command as much as $890 on the black market.[7] This is a clear indication of the severity of the shortage, the priority placed on the service, and the relative affluence of some consumers.

Table 9 **Access to Electricity**

	Number of Subscribers	Per Cent of Households
Sana'a	23,973	77.2
Ta'izz	9,587	56.4
Hodeidah	7,871	41.5
Ibb	2,168	54.0

Source: World Bank, Yemen Arab Republic: Urban Sector Report *(Washington, D.C., March 1981), p. 37.*

Projected Growth

The recent growth of Yemeni cities has been the outcome both of natural population increase and of migration from rural areas. The World Bank has estimated that by 1975 internal migration accounted for about 25 per cent of the residents of cities over 15,000, or some 70,000-80,000 people.[8] These migrants, mostly single males, are attracted by the availability of jobs in the urban-based manufacturing and construction sectors which have grown the most markedly in the past decade.

The Bank projections for urban growth in Yemen to the year 2000 take into account the different economic roles played by the major cities: Sana'a, the capital and link to the rest of the world; Hodeidah, the largest port, with cheap land available for expansion; Ibb, a rapidly growing agricultural centre; and Ta'izz, the old capital, constrained in its growth by its rugged topography. The high growth projection shown in Table 10 assumes a rate of natural increase of 2.7 per cent and holds temporary emigration constant.

Administration and Finance

Urban administration in Yemen is primarily the responsibility of the central government. The country is divided into eleven governorates, each headed by an

Table 10 **Urban Resident Population, 1975-2000** (High Estimate)

	1975 Adjusted Resident Population	1975-80 Annual Growth Rate (%)	1980 Absolute	1980-85 Annual Growth Rate (%)	1985 Absolute	1985-2000 Annual Growth Rate (%)	2000 Absolute
Sana'a	138,625	8.8	211,000	8.0	310,000	6.0	742,900
Hodeidah	82,724	9.0	118,800	9.5	187,000	9.5	729,500
Tai'zz	81,001	6.6	111,500	6.0	142,200	6.5	383,700
Dhamar	20,051	5.5	26,200	5.5	34,200	7.0	94,400
Ibb	19,638	10.2	31,900	9.0	49,100	9.0	178,800
Bayt al-Faqih	12,703	4.5	15,800	5.0	20,200	6.5	52,000
Al-Bayda'	11,088	6.5	15,200	4.5	18,900	4.5	36,600
Total Urban Population (over 10,000 residents in 1975)	365,830	7.7	530,400	2.8	768,600	2.9	2,217,900
Population in 9 Towns of 5,000-10,000 in 1975	61,144	5.5	79,900	6.0	106,900	7.5	316,300
Population of 38 Towns of 2,000-5,000 in 1975	113,888	3.6	135,900	4.0	165,300	5.5	369,000
Population in Rural Settlements of Less than 2,000 in 1975	4,717,716	2.2	5,251,800	2.2	5,847,200	1.9	7,734,800
YAR Resident Population	5,258,578	2.7	5,998,000	2.8	6,888,000	2.9	10,638,000

Source: World Bank, Yemen Arab Republic: Urban Sector Report *(Washington, D.C., March 1981), Table 9.*

appointed governor. Within these, the municipalities are run by centrally appointed directors-general. Several ministries are involved in managing the cities. The Central Planning Organisation is responsible for co-ordinating development programmes of the individual ministries and implementation of the five-year plans. It therefore has a role in all municipal programmes, but it is severely handicapped by insufficient technical staff. The Ministry of Public Works handles surveying and mapping, public buildings, rural water supply, and supervision of the Port and Highway Authorities. It also operates the Land Registration Office, which maintains records of all private land and property holdings. The ability of the Land Registration Office to keep accurate records will determine the government's ability to settle ownership disputes or impose property taxes.

The Ministry of Municipalities and Housing has primary direct responsibility for urban affairs. The major activity of its central office (the Physical Planning Department) has been the preparation of master plans for the five largest cities, focussing on densities and street lay-outs. The ministry is now trying to implement these plans; however, since it has neither the funds nor the legal authority to acquire land for its schemes, it is encountering some difficulties. Local offices of the ministry are responsible for providing construction, maintenance and sanitary services, but they rarely have sufficient staff to accomplish all of their duties. They are also responsible for the issuance of building permits, an authority that could provide a basis for maintaining records or controlling construction.

Funding for municipal government comes from the central administration. The municipalities have no power to collect funds or levy taxes for their own use, but they have responsibility for collecting certain fees and fines that are turned over to the central government. The only "urban" taxes, a 10 per cent real-estate sales tax on non-agricultural property within a specified radius of the city centre, and a rent tax, are collected by the Ministry of Finance. But the inadequacy of the land ownership records makes any property tax system difficult to enforce. In some cities, municipal projects have been funded from local contributions and voluntary "betterment taxes" levied by the Local Development Associations (see below, Rural Development). The development of an accurate system for recording urban properties, their owners, and their values is seen as a first step towards better management of city finance.

Housing

Housing shortages are not a problem in Yemen, as they are in many developing countries. Densities are low at 380 people per hectare in the most build-up parts of Sana'a, and over-crowding of the kind common in other parts of the world is

rare. Data on housing space standards indicate that even the poorest families occupy an average of 67 square metres, and most dwellings are occupied by single families.[9]

Several factors account for the relatively loose urban housing market. In part it is simply because Yemen has not yet undergone the volume of urban growth experienced elsewhere. The traditional character of Yemeni society may also account for the lack of over-crowding; the value still attached to family privacy has been credited with deterring the migration of entire families if this would require sharing accommodations with unrelated people. The availability of relatively inexpensive land for new construction may also be a contributing factor. In Sana'a large areas of government land have been sub-divided and sold at prices affordable by low-income groups. Because it is poorly serviced peripheral land and because the plots are small, the prices have not been bid up by higher-income people. Moreover, the inadequacy of ownership records makes land tenure uncertain, decreases demand for some plots, and helps keep prices down. In Hodeidah government land has not actually been sold, but squatting is widespread. Although the settlements have not been legalised, people have not been forced out.[10]

Nevertheless the cost and quality of housing pose problems in Yemeni cities. Increased demand for urban housing generated by remittances and by rural urban migration has driven up prices and reduced the ability of low-income people to maintain traditional living standards. In 1978 a Housing Credit Bank was created both to capture the workers' savings and to provide housing finance. It is operating at a fairly small scale, and eligibility requirements include steady income, thirty per cent equity, and legal title to the land. Consequently, it has not been of help to the lowest income groups. Moreover, restrictions placed on it by the Central Bank have kept it from expanding the scope of its operations, and the required margin between its borrowing and lending rates keep it from operating at a profit.

The government is involved with six public housing projects, all but one of them in planning or under construction as of the latest information available. These have generally been designed for particular target populations not defined by income. Funding comes from a number of sources including the Yemen Bank for Reconstruction and Development, the Ministry of Labour, the military, the Ministry of Municipalities and Housing, the United Nations, and the University of Sana'a. In addition, the World Bank is financing core housing and squatter settlement upgrading projects in Sana'a and Hodeidah.

Rural Development

Like the country as a whole, rural areas experienced very little economic growth or development before the 1970s. The difficulties of travel posed by the country's terrain and the lack of intervention by previous governments in rural areas resulted in the neglect of rural infrastructure requirements. Investment in modern communications and transportation has just begun, with the first long-distance paved road, connecting Sana'a to Hodeidah, completed in the early 1970s.

The prosperity of the 1970s has had a direct impact on the rural areas, as new consumer demands have changed the structure of Yemeni agriculture. With new capital from remittances, and with shortages of labour, farmers have invested in mechanical equipment, fertilisers, pesticides and better seeds. Fields have been switched from barley and wheat to crops offering higher profits (including the highly profitable *qat*). On the whole, these changes have increased productivity and boasted rural incomes. However, they have also created problems of conservation and environmental protection. Use of pumps has increased water supplies, but is lowering the water table and threatening to present salinity problems. Terraces, which are valuable to labour-intensive farming, are now less profitable and are consequently falling into disrepair. Over-grazing and misuse of capital equipment such as tractors lead to moisture depletion and erosion.

Since 1962 rural development in Yemen has been the responsibility of Local Development Associations (LDAs). These are voluntary associations, organised at the sub-district level, with an elected leadership and broad popular participation. They are responsible for setting priorities for infra-structure investment and for managing the construction and maintenance of projects. Reflecting the concerns of district residents, their expenditures are concentrated in a few areas, with 70 per cent allocated to roads, 19 per cent to schools, and 6.6 per cent to water projects.[11]

The LDAs receive strong support from the government. Local initiatives are integrated into central plans and budgets, and the ministries provide as much technical support as they can. Local district officials defer to LDA representatives on development issues, and the assistant secretary-general of the Confederation of Yemeni Development Associations is a cabinet minister.

LDA funding comes from several sources. The central government grants a fixed 75 per cent of the religious taxes of each district to its LDA, and 2.5 per cent of customs duties are allocated for LDA use. The government also provides contributions to specific projects, technical assistance and equipment. A Co-operative Development Bank has been established, with initial contributions from the government and the Confederation of Yemeni Development Associations. Individual contributions from project beneficiaries, assessed on the basis of ability to pay, provide a substantial portion of the costs of many projects. Additional assistance comes from foreign

donors, international agencies, and charitable organisations.

The LDAs have apparently been very effective as a system both for directing local development and for stimulating popular participation in planning. In large measure this may be attributable to the cultural values of rural Yemen, which suggest that a locally managed system of development could be more effective than a highly centralised one. It may also be a result of the strong support the Associations receive from government. Moreover, unlike municipal administrations, the LDAs have direct control over collection and disposal of their own funds, and this gives them the power they need to ensure active local participation.

1981-86 Five-Year Plan

The 1981-86 Five-Year Plan identifies the major constraints on Yemeni development and sets out objectives and strategies for future growth. In general its goals are to restrain rural to urban migration, and to reduce dependence on imported goods and services by relying on the resources available within the country. In agriculture, this involves increasing output both for domestic consumption and for export, while avoiding further damage to the environment through inappropriate techniques. Elsewhere, it means strengthening the country's ability to build roads, sewerage systems and other large infra-structure projects anticipated for the next few years. In industry it involves identifying extractive and manufacturing opportunities and encouraging their development.

Strategies for the implementation of these goals include projects to improve conditions in rural areas, among them electrification, water purification and construction of systems for sewage disposal. In agriculture the government plans to encourage the use of co-operatives and the development of food-processing industries. They will work on the building of roads to link remote areas to the rest of the country, and on improving telecommunications. Water resources development is also given priority, both in finding new sources and in preventing waste and misuse. There is a general interest in regionally-balanced development, which means building infra-structure outside the major cities and providing incentives for industrial development in peripheral areas.

Other strategies are designed to keep urban growth under the control of municipal authorities and to discourage further rural to urban migration. Projects are planned to map the cities, register all real estate properties, and to develop codes and regulations to protect public property from illegal seizure by squatters. The streets are to be named, all houses assigned numbers, and the master plans prepared by the Ministry of Municipalities and Housing revised and updated. Co-operation with *waqf* authorities will allow use of *waqf* land for housing complexes, markets and cemeteries. The responsibilities and powers of each level of government are to be defined, with links to executive agencies clarified.

In the areas of economic policy and finance, the government hopes to use a tight monetary policy to reduce consumption and control inflation. The objective is to increase savings, especially in financial institutions which will be able to lend money locally for productive investments. Particular importance is given to improving the tax system, finding new tax bases, and developing the administrative mechanisms to collect them.

The plan sets out four specific criteria for the allocation of investment:

- In agriculture and industry, resources go to regions with high development potential.
- Infra-structural allocations are to be directly related to population and remoteness of the district.
- Allocations for housing and services are to be based on district population.
- Major productive investments are to be located near to, but outside of, the three largest cities.

Rural Architecture

Basic Characteristics

Traditionally, Yemeni rural architecture has displayed a closely-knit, highly organic pattern governed by defence considerations. Villages consisted of clusters of stone and brick structures on high, commanding locations. The inhabitants had a clear and unencumbered view of the surrounding territory, which made these settlements very difficult to attack. The house and village forms are the result of family patterns, both nuclear and extended, interacting with land-ownership patterns and the exigencies of the site.

The structures range from simple watch-towers, similar in form over a wide geographical area, to complex tower houses and fortified hamlets. An interplay of solid masses and voids articulating the space between structures creates a rich composition that emphasises the main central space and location of both religious and commercial buildings.

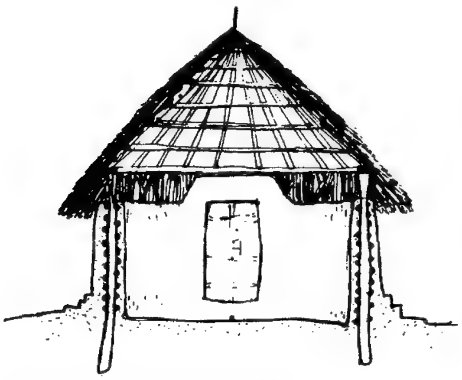
The architecture of Yemen is noted for its verticality. Tall, narrow structures reach unusual heights and create a distinct style. These structures frequently have granaries and store-rooms on the ground floor, with few, if any, windows. The upper floors are for residential use. This practice enables the residents to have a view of the spectacular scenery and is also an efficient defence.

The size and complexity of a settlement reflect the composition of the group who inhabit it. Ideally, a hamlet is the home of members of the same family or clan and a village houses members of the same tribe. *Bayt*, the word for 'house', which is used to designate a patronymic lineage, may also be used for a 'small agglomeration' often bearing the name of the original family who settled there. The

house of the village leader is often the centre of, and the starting point for, the development of a settlement. His house is the largest and can perform the role of a citadel when members of the settlement need to seek protection.

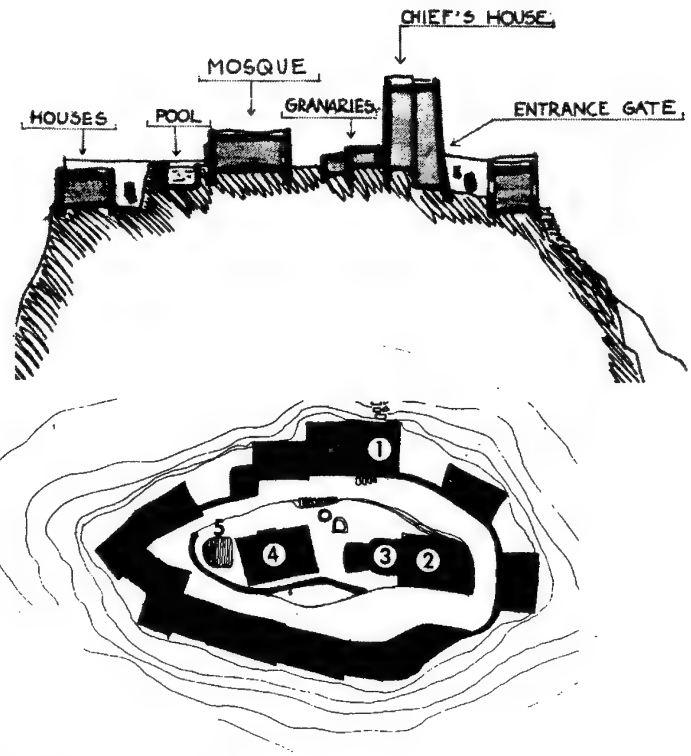
The architecture of Yemen also varies from area to area, each region having its characteristic settlement patterns, densities, house forms and building materials. In the Tihama, the coastal strip, reed and brick are the traditional building materials, though mud is often used with reed as a binding and insulating agent in interior finishing, or to create compound walls. Reed is used for both market buildings and houses. These buildings exist in a great variety of circular and rectangular plans, roofing forms, methods of weaving fibres, interior and exterior surfacing, decoration and general spatial organisation. Religious buildings are more monumental and are built in brick or stone masonry; mosques are at times covered by brick domes.

In the midlands and the highlands, stone architecture predominates; combinations of mud and stone are sometimes used in the valleys and flatlands. The quality of the stone and face cutting vary by region, as do ornamentation (inlaid or painted), and the importance given to fenestration. The architecture of this area varies from tall buildings of well-cut, almost white limestone, with richly decorated facades



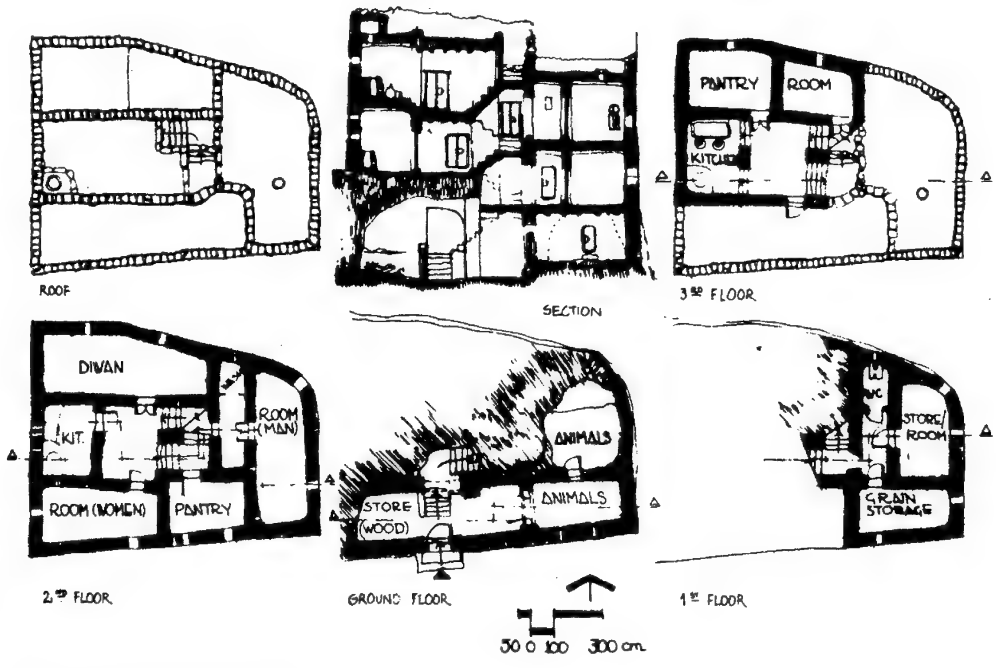
Section of a typical reed house.

Source: Fernando Varanda, Art of Building in Yemen.



Form of a hilltop hamlet.

Source: Fernando Varanda, Art of Building in Yemen.



Typical highland house plan.

Source: Fernando Varanda, Art of Building in Yemen.

and windows, to stone-walled huts with thatched roofs in isolated or grouped hamlets. Most striking are the tall, majestic houses displaying sophisticated stonework and fan-light fretwork.

In the eastern highlands and plateaus, construction is entirely in mud in the north and north-eastern fringes. However, in the semi-desert mountains of the south-east, stone is used alongside and in combination with mud in a characteristic style. The two basic forms of mud building are coarsed clay, *zabur*, and sun-dried blocks, *labin*. The architecture varies from simple walls with strongly marked separations between the mud layers to a distinctive grooved band of mud along the top of buildings. Colour is the main decorative device; it is applied to interiors and exteriors in stripes of red ochre, alternating with bands of yellow ochre and white plaster around the openings. Roofs are often topped by a row of white, plastered, triangular motifs.

Changing Patterns

Changing patterns in site selection and configuration of agglomerations are slow to emerge since investment in fixed assets mitigates against movement and change. Nevertheless, certain trends are noticeable, as the need for individual and communal defence decreases with the growing strength of the central authorities. Proximity to roads, with their promise of accessibility to utilities and services, is increasingly prized, as new wealth makes possible immediate benefits, particularly piped water and television.

The impact of urbanisation and migration abroad has had its effect on rural areas. Depopulation, initially of working males and subsequently of entire families, has left villages deserted, especially in the poorest agricultural areas of the north.

Urban Architecture

Verticality is as predominant a characteristic of Yemeni architecture in the cities as it is in the country side. Multi-storey structures house several families, and frequently have shops on the ground floor with residential spaces above.

The settlement patterns of Yemeni towns are typical of traditional Islamic cities: a tightly knit fabric composed of markets (*suq*s), caravanserais, mosques, shops, warehouses (*samsarah*s), and residential quarters. Almost all larger towns and cities in Yemen are fortified. Major thoroughfares are enriched by the often elaborate facades of the houses which always face onto the street. Streets are also spaces where children play, and marriages, funerals and other processions take place. In larger towns, small residential streets sometimes serve as gathering places for women. Although some stone-paved streets can still be found, little remains of the old paving.

The houses perpetuate the archaic defensive prototype of the countryside, while at the same time adapting well to the urban pressures of high land values and limited building space. In Sana'a, very high residential densities are balanced by cultivated areas within the city walls.

Densely-packed houses from five to nine storeys high give rise to shaded, narrow streets edged by 20 to 50 m high facades. The lower portions of the house walls are usually of stone, stark, with a few openings, and white washed for protection against rain. The upper portions of the walls are built of baked brick with relief decoration and windows with plaster decoration around them. Roofs are flat, well water-proofed, and used for various functions such as drying clothes and growing plants and herbs. The rear elevations of houses overlook communal gardens and orchards owned by the *awqaf* and often attached to particular mosques.

The combination of building materials characteristic of rural Yemen extends to its urban areas: mud and brick, in the southern part of the eastern plateau; mud, brick, and stone to the north. In Sana'a, mud brick dwellings are highly appropriate to the temperate climate. In Ta'izz, buildings require a higher level of maintenance and water-proofings to withstand the longer monsoon period. Hodeidah's hot and humid climate dictates the need to have exterior shaded spaces and cool interior spaces. This is achieved by its mud, clay and grass structures.

Architectural Elements

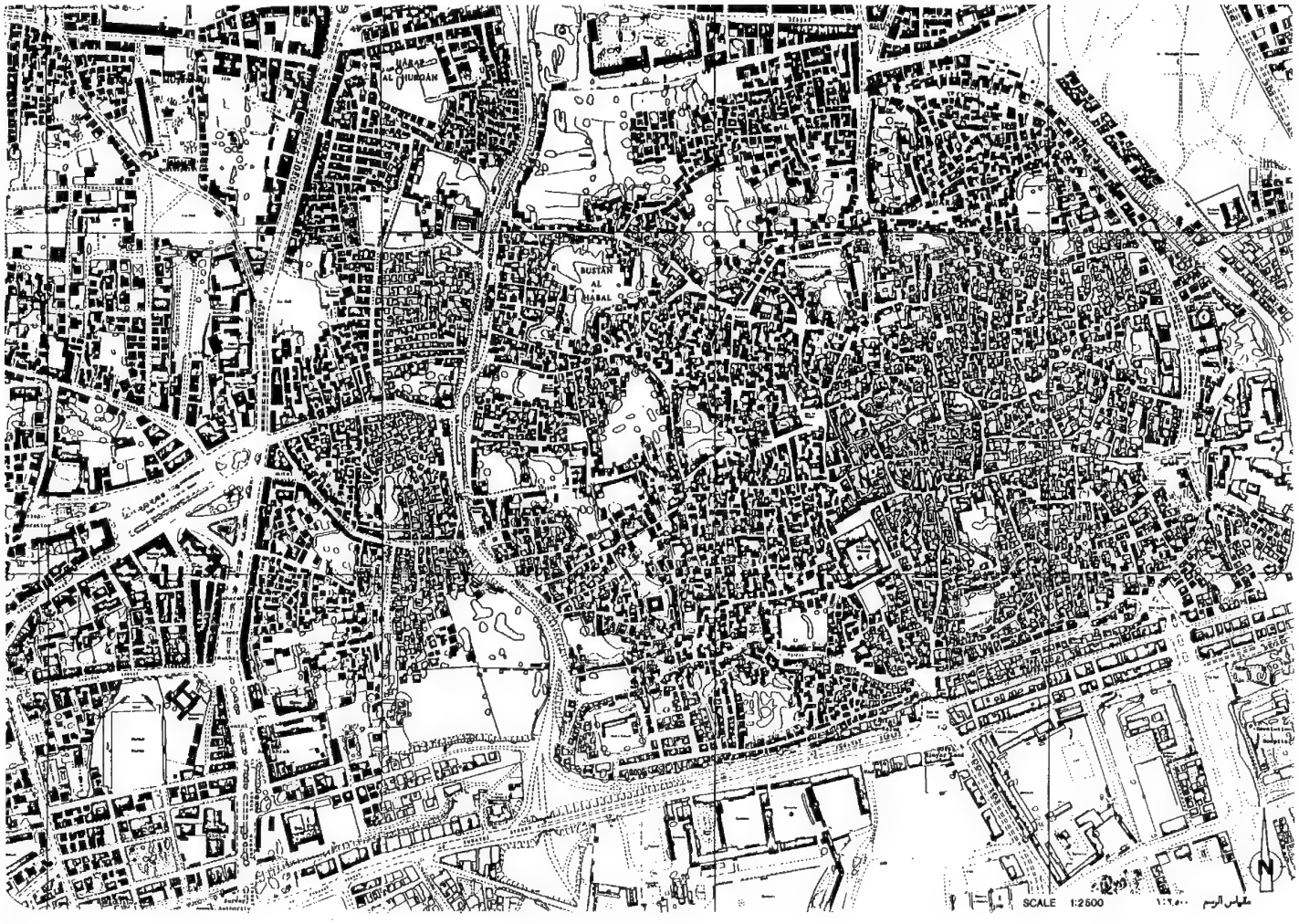
Siting

Perched on mountain tops and hilltops, the preferred locations for most highland settlements, villages blend so extremely well with the surrounding landscape that they are often hard to distinguish from the dramatic rock formations found in these parts.

In settlements on flatlands or in valleys, the lack of natural vantage points was compensated for by watch-towers that constituted an advanced guard line. In other cases, the defence requirements of a settlement or town were met by forts or citadels situated on high points overlooking the site. These are found throughout the country; most were built in the Ottoman period.

House Style

The Yemenis take great pride in their houses and painstakingly devote attention to their construction, decoration and furnishing. In terms of spatial organisation, seven house types have been identified in Yemen, four in the mountains and three on the coastal plain. The most important of these is the tower house, which includes all the elements observed in the other types.



Old city of Sana'a.

Source: Yemen Arab Republic, Survey Authority, Sana'a, 1982.

The most elementary house has one storey, is built in stone or stone and mud, and is divided into rooms for living, for keeping animals and for storage. Its shape is adapted to natural features of the landscape and adjacent housese to form clusters. Houses often have no windows; they are lit and ventilated by openings in the roof. There are no sanitary installations within the dwelling. The plain interior surfaces are plastered with mud.

A more developed house type, built in stone, mud blocks, or stone and mud, has two storeys, with an external stair to the living quarters on the upper floor. The ground level is used for storage and keeping animals, and sometimes accommodates the kitchen. Sanitary facilities are not generally included within the house. The windows have regular shutters with a fan-light above. Interiors may be finished with lime or gypsum plaster but are more usually surfaced with mud. Parapets and windows may be adorned with simple decorative motifs. This house type usually occurs in rows and is common in small towns between the midlands and the highlands.

The tower house, probably evolved from the watch-tower, is built of earth, stone, baked brick, or a combination of these materials, with three or more storeys and an interior staircase that allows vertical expansion as more space is needed. A common feature is the *shubak*, originally

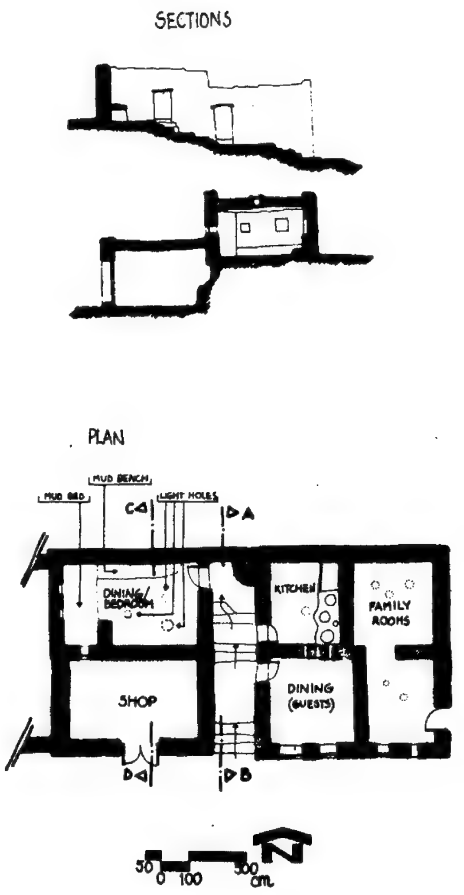
the observation casement in a watch-tower and later the fenestrated, cooling box in a box. Circular house forms exist, but the quadrangular plan is most common. Light and ventilation are usually provided through windows and wall ventilation slits (*shaqus*). Additional light may be provided by fan-lights of alabaster or coloured glass set in stucco tracery frames which cast richly coloured patterns. Bathing and toilet facilities are included within the house.

A variant of the tower-house form exhibits a top floor courtyard with light wells (*shamsiya*) for the lower floors, a feature of uncertain origin. The distinction between rural and urban houses, clearly apparent in their external aspect, is also evident in the allocation of interior space. Urban houses allot more space for living quarters, not only for the family, but also for the reception of visitors, an important part of social life.

Patterns of use vary with social practice. In rural areas married sons often build their own houses. However, it is not uncommon for three generations and several nuclear families to live together in the large houses of the wealthy, each family unit having its own room or storey and sharing certain communal rooms. The best rooms are usually reserved for the oldest members of the household, and are the best lit and ventilated ones.

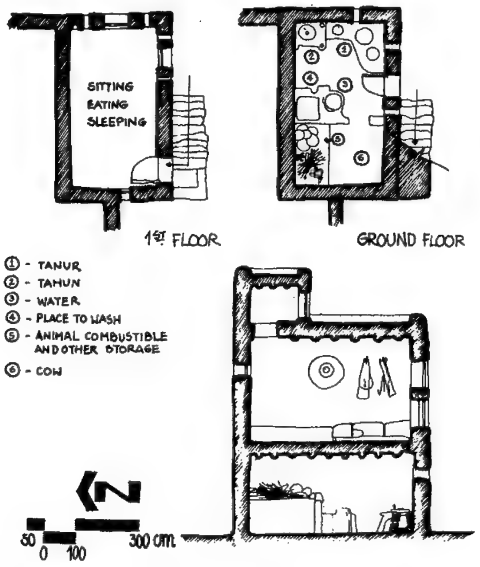
In the houses of the highlands, circulation and service areas face north; the best rooms face south. This orientation changes in the south and in the Tihama region because of the hot climate. In large houses, even in the highlands, room use frequently changes according to the season, allowing people to sleep in the warmest rooms during winter and the coolest in the summer.

The hierarchy of space within the house is further articulated by different floor treatments. The difference between circulation zones, where shoes are worn, and living rooms, where shoes are taken off, is often emphasised by the raising of door thresholds, defining the beginning of the



Schematic drawing of an elementary house form.

Source: Fernando Varanda, Art of Building in Yemen, *p. 78.*



Simple form of a two storey house.

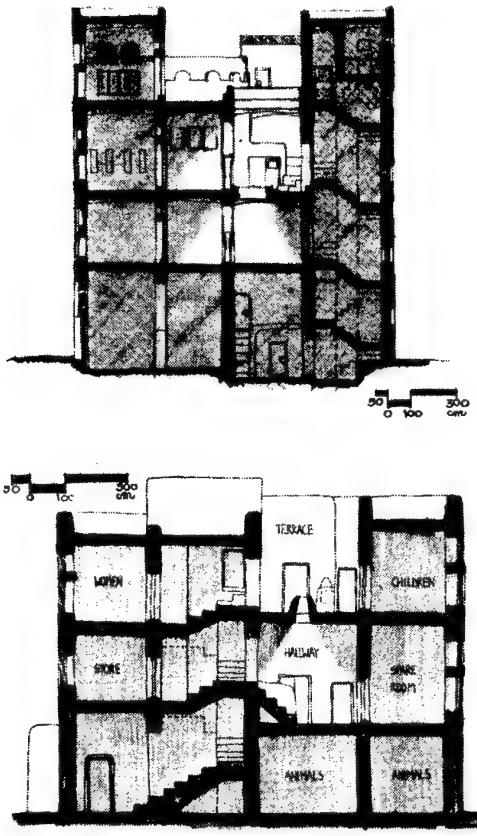
Source: Fernando Varanda, Art of Building in Yemen, *p. 79.*

living quarters.

The ground floor of the house usually contains a lofty entrance hall, *dihliz*, stables and store rooms. Rural houses include storage for farm equipment and fodder and may also contain an underground storage pit, *madfin*. The ground level of houses near the market is often used for shops. Stairs lead from the ground to the top floor around a stone newel, *qutb*, the solid backbone of the house. Stairs are of either stone or mud, in short runs with corner landings. Finished stone steps average 25 cm riser and 25 cm tread. Most stairs are lit and ventilated by reticulated windows at the landings that constitute, together with the *shubak*, the cross-ventilation system of the house.

The second floor, sometimes also the third floor, contains additional store rooms, household pantries, and the largest room in the house, the *diwan*. The *diwan* is a reception room for special functions, and it is also the room where tribesmen meet. Because of structural limitation, its width usually does not exceed 3 m, but it may run the entire length of the house. Larger houses may contain more than one *diwan*. The ceilings of the bathroom, kitchen and hallway may be lowered to provide additional storage space.

The upper floors of the tower house containing the sleeping rooms, sitting rooms, dining areas, kitchen and bathroom, are the most private. A segregation of sexes is maintained. The most privileged rooms in the house are the *mafraj* or *manzar*. The *mafraj* is generally about 12 to 18 sq. m. in area and is located on the top

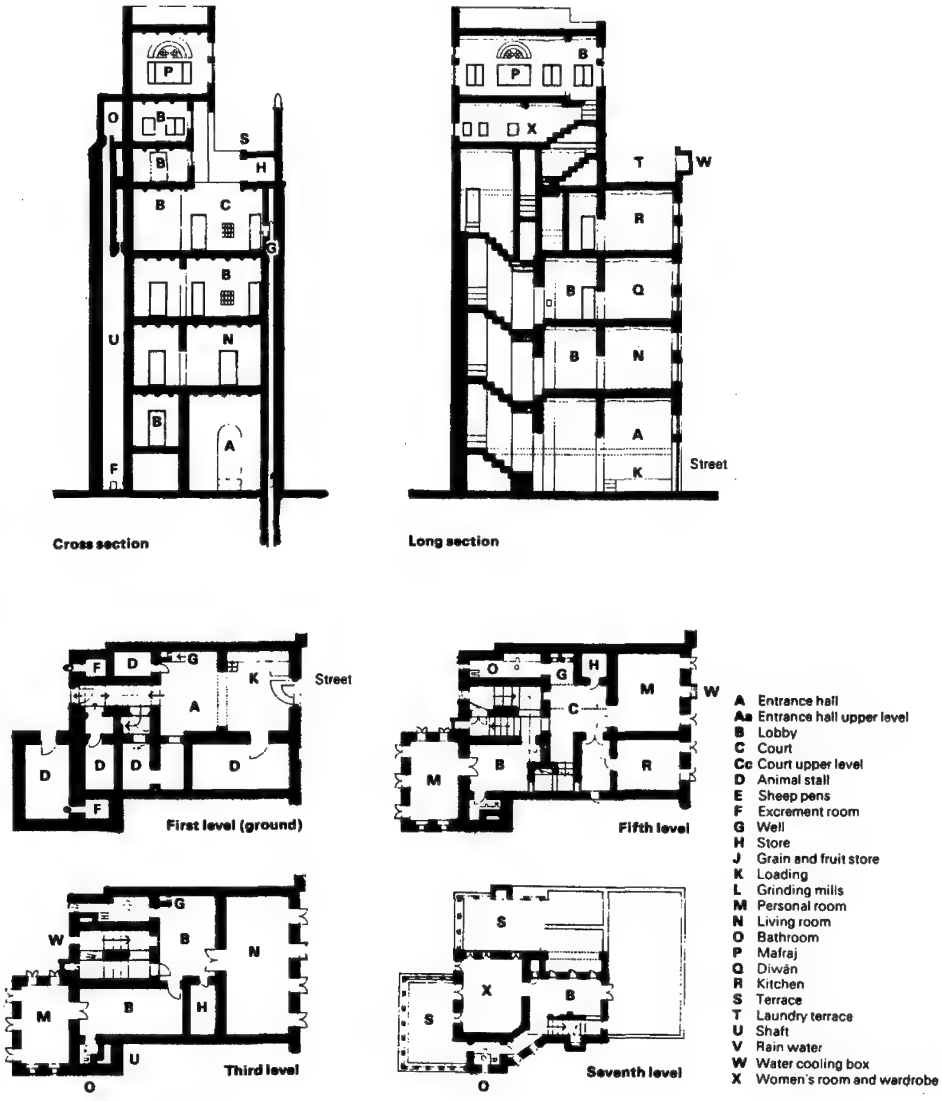


Tower house with a top floor courtyard.

Source: Fernando Varanda, Art of Building in Yemen, *p. 82.*

floor; the *manzar* is a separate attic at the top of the house, exclusively reserved for the house owner and his special guests. Another important feature of the house is the ablution facilities, *masfa*. It may be in the ante-chamber, at one end of a room, or on the roof. In some houses an adjacent space for prayer is provided.

The bathroom consists of a store or mud latrine, a washing area, a large water container, and a shallow trough which channels liquid waste outside. Liquid and solid waste are separated. In tall houses, liquid waste flows down a surface water-proofed with lime plaster (*nura*), evaporating before it reaches the ground. Mud



A highland town house.

Source: James Kirkman, ed., City of Sana'a, *pp. 49-50.*

houses may use a drain-pipe which juts out from the wall. Low houses have a drainage sump to collect the waste. In the east and south-east, solid waste from the latrine falls down an inclined stone to the outside where it quickly dries. In the highlands and the old town of Sana'a, solid waste is collected to be used as fuel, particularly for public baths, and the ashes as fertilizer. Elsewhere, human excrement is used as manure. The introduction of domestic piped water before an alternative sewage system was devised has unfortunately resulted in open sewers.

Response to Climate

The traditional Yemeni architecture is well adjusted to the hardships of the various climatic regions of the country. In dry climates where diurnal variations in temperature are great, houses are built with stone, brick or mud walls of a thickness of 50 cm and over. The insulating quality of these walls reduces the differences in temperature within the dwelling. In hot and humid areas, the traditional buildings have high ceilings and large openings for cross-ventilation.

Decoration

Yemeni architecture has been notable for its heavy use of decoration. Stone and brick structures have elaborate facades with complex geometric designs. On structures made of mud bricks, the facade is covered with a mud/lime "plaster", and a gypsum-based white-coloured plaster is used to accentuate the windows. Plaster and glass mosaics are prevalent in urban centres in certain parts of the country.

Changing patterns of decoration reflect both economic considerations and skill constraints. The rising costs of decorative work and the scarcity of skilled labour have tended to make modern facades much less elaborate and sophisticated. Yet the presence of wealth generated from migrant labour has inevitably led to ostentatious displays of affluence, leading to painted facades. This type of decoration eschews subtle design for bold patches of colour and a primitive assertiveness.

Building Construction

Tower houses may have as many as eight storeys. They are constructed with load-bearing walls of exposed hewn stone or rammed earth or earth-blocks, depending on the material available in the region.

Problems of stability in structures of such heights have given rise to a number of ingenious engineering solutions. In Sana'a, stone or brick walls are strengthened horizontally at intervals by exposed timbers parallel to the faces of the walls, held in place by short wooden cross-pieces. These timbers take up stresses caused by unequal settlement or earthquake shocks. The lower parts of the tower-house walls are of more massive construction than the upper storeys; they are made of stone or at least have stone foundations. The upper storeys are of burnt or semi-dried brick or cob, and become progressively thinner with each floor. The roofs are flat, made of timber beams, branches, and a layer of 40 to 50 cm of earth. The walls and the ceilings are plastered with gypsum plaster; the floors are usually paved with flag stones in halls and circulation areas, but with plaster in the rooms. Doors and windows are made of imported hardwood.

Most structures outside the big towns are built with the traditional construction methods. They give very satisfactory results, but have one major handicap: the roof cannot have a span much wider than 3 metres because the local timber, a kind of acacia, comes in irregular shapes and in pieces not longer than 3.50 m.

Recent construction in the towns relies mostly on reinforced concrete frames. Walls are made of concrete blocks. Sometimes an additional facing of local stone is added, but it is extremely expensive. Cement blocks are usually plastered with terrazzo tiles and doors made of imported hardwood or steel and frequently painted.

Construction Costs

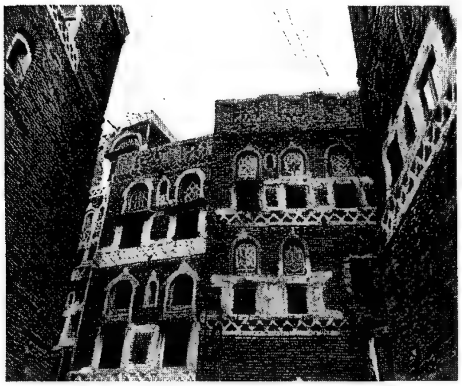
In a sharp reversal during the past decade, traditional construction actually became much more expensive than modern construction: 1800 YR/m^2 for stone and slab as against 1200 YR/m^2 for cement block.[12] Part of the general increase is attributable to the inflation in the prices of materials, but the bulk is accounted for by the high cost of skilled and semi-skilled labour due to the shortage created by massive migration.

A recent World Bank study[13] noted that the costs of construction have been rising much more sharply than any other economic indicator, with labour costs the most important factor in this escalation. Between 1975 and 1981 construction costs rose by 262 per cent; the daily wages for skilled workers rose by 600 per cent; and the wages of unskilled labour by approximately 300 per cent.

The Effect of Urbanisation on Architectural Form

The urban areas are finding it difficult to cope with the influx of population, while rural areas are becoming depopulated and agriculture is suffering from a labour shortage.

The urban housing problem is a new problem for Yemen. Pressure on urban land has led to the proliferation of squatter settlements. Demand is pushing up prices, and lower-income people are



Ornamental facades in the Sana'a region.

Photo: C. Little/Aga Khan Awards.

being edged out to peripheral, unserviced zones, often outside the legal land market.

In squatter settlements, accommodations vary in size and construction in different cities in response to the availability of land and building materials. In general, shacks have average areas of 12 sq. m. and construction materials include cardboard, bamboo poles, wood, plastic, metal, tin sheet, auto parts, stones and cans. Activities like cooking and washing take place in semi-private areas outside, since the rooms are extremely small. With almost no basic services, people have to depend on their own ingenuity to survive. The government has chosen to launch sites-and-services projects and upgrading programmes rather than to eradicate these settlements.

That architectural form is changing is as evident in the buildings of the rich expatriate workers as it is in the houses of poor squatters. Recent construction has exposed Yemenis, local residents as well as expatriate workers, to architectural forms and technologies sharply contrasting with traditional styles, methods and materials.

Informal sub-contracting, self-help and mutual-help have always been common practices for building houses and small-scale projects, but modern large-scale projects require formal contracting methods, eliminating the participation of the smaller local contractors. Foreign construction firms have provided services for building ports and airport facilities, public buildings, and factories. Local techniques and materials are not suitable for large-scale projects where speed of execution is of vital importance. Economic development made the introduction of modern construction technology unavoidable.

Retaining the traditions, the received social patterns, and the value placed on family privacy is becoming extremely difficult. Families are smaller and require less space, and population movements are disruptive of neighbourhood cohesion. The preference that a single family should occupy a complete house is often precluded by escalating land cost and rents, and competition from commercial uses.

Government authorities have encouraged retaining the traditional character of buildings through regulating the use of stone and other local material for cladding, window decoration and so forth. But traditional decorative motifs are not sufficient to make a building harmonise with its surroundings. Structures with reinforced concrete frames stand out among older buildings because of the marked difference in scale, proportions, and number and type of openings.

Cement blocks are ubiquitous in large cities as well as smaller towns. Glazed windows are common, but not always climatically appropriate. Decorations are less elaborate and often not hand-crafted. However, social status and wealth are exhibited through facade decoration in the neo-traditional style. This is clearly a reflection of the deeply-rooted attachment of the Yemenis to their cultural heritage.

Reference Notes

[1] Unless otherwise noted, all data in this section, are from the YAR Central Planning Organisation, *Statistical Year Book 1981* (Sana'a, April 1982).

[2] World Bank, *Yemen Arab Republic: Development of a Traditional Economy* (Washington, D.C., 1979), p. 19.

[3] YAR Central Planning Organisation, *Second Five-Year Plan* (Sana'a, 1981), p. 13.

[4] World Bank, *Yemen Arab Republic: Development of a Traditional Economy* (Washington, D.C., 1979), p. i.

[5] *Ibid.*

[6] YAR Central Planning Organisation, *Second Five-Year Plan* (Sana'a, 1981), p. 13.

[7] World Bank, *Yemen Arab Republic: Urban Sector Report* (Washington, D.C., March 1981), p. 36.

[8] *Ibid.*

[9] *Ibid.*, p. 52.

[10] *Ibid.*, p. 43.

[11] World Bank, *Yemen Arab Republic Local Development Associations: A New Approach to Rural Development* (Washington, D.C., March 1981), p. xx.

[12] Ismail Serageldin, "Rural Architecture in the Yemen Arab Republic: The Impact of Rapid Economic Growth on Traditional Expression", *The Changing Rural Habitat: Proceedings of Seminar Six* (Geneva: The Aga Khan Awards, 1982).

[13] *Yemen Arab Republic: Urban Sector Report* p.48.

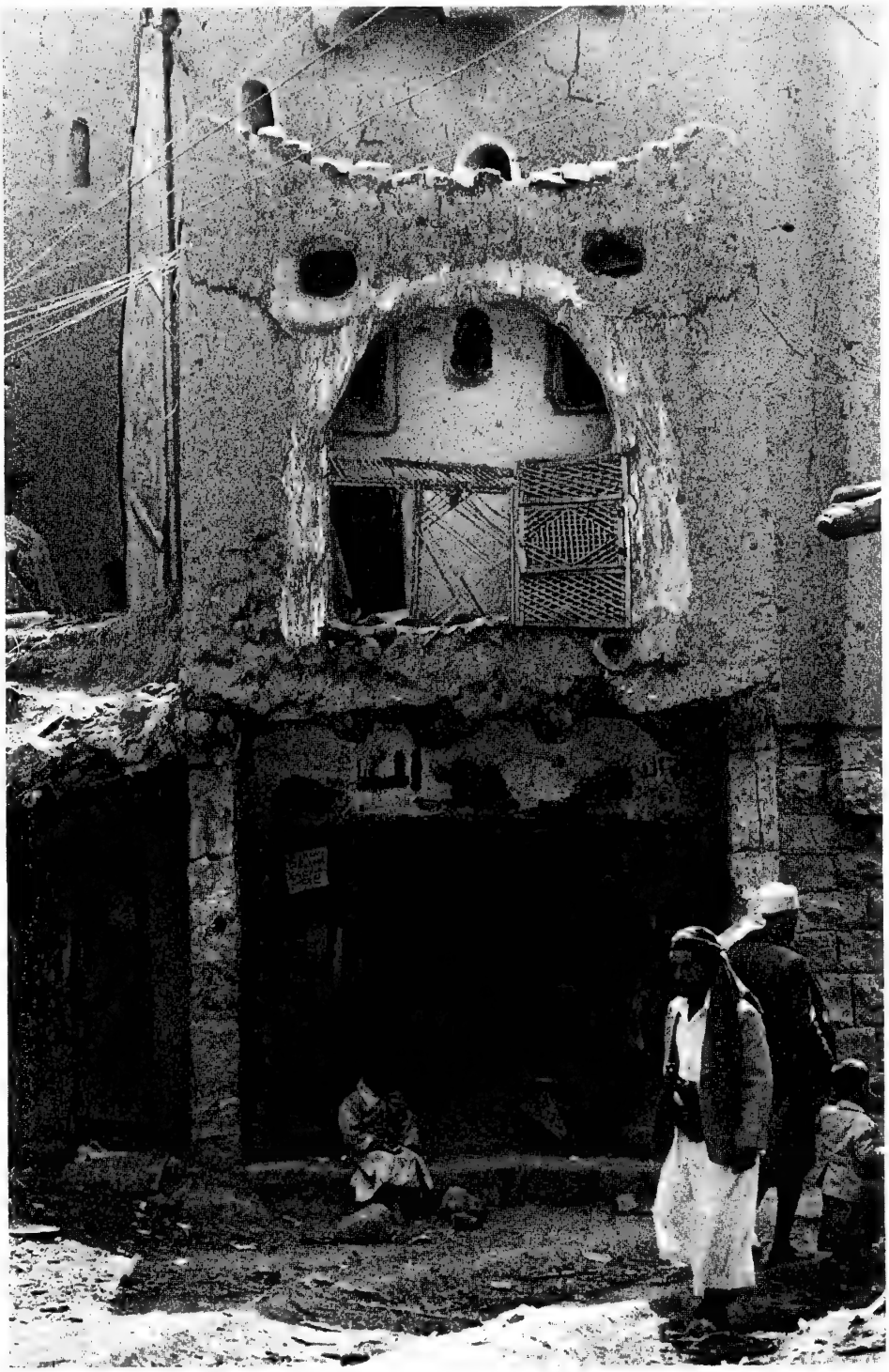
Amran

Fernando Varanda

Amran, located in the alluvial plains north of the territory of Hamdan and east of that of Shibam, occupies a privileged position as a control post of the routes converging from the north, west and east to the main link with Sana'a. Its position has oscillated over the centuries from being an outpost of Sana'a in the north to that of being the centre for the ancient and powerful confederation of the Hashid and Bakil tribes.

The very name of the town itself as well as the wealth of pre-Islamic elements incorporated in later stages of construction point to its old origin. Known as A'aran in pre-Islamic times, the town used to be surrounded by marsh land. Sometime around the second century B.C., a major drainage project was begun by a tribal leader in the Hashid confederation and the land was made suitable for agriculture. In its immediate vicinity can be found important pre-Islamic vestiges.

It is a walled town with three gates in use: one to the east, opening to the road to Sana'a and also leading to points north and north-east; one to the south, connecting to the Hajjah road and serving at the same time as an outlet for the periodically-flooding stream, Sayla; and one to the west, leading to the area of Yal Yazid. The hub of the old market inside the walls is at this gate and the market



Amran.

Photo: C. Little/Aga Khan Awards.

extends along the bed of the stream all the way to the South gate which is in use when the Sayla is not running. In the market area, next to the West gate, are a mosque and the local administration building. In front of the shops the market has an extended colonnade, which, despite its crudity, betrays a concern for defining spaces utilising elements inherited from a noble past. A short distance away, at the north-western edge of the town, are a great mosque with a brick minaret having fine inlaid designs and an adjoining orchard — the only green space within the town walls. The walls themselves are in stone but the bulk of construction in the town is of mud brick with stone utilised for raised foundations or ground floors.

The residential part of the town is complex enough to create a network of streets and squares that define a very characteristic atmosphere. The houses often have upper floors projecting from the plane of the ground floor facades. They are usually crowned by a roof-line of wide, freely-shaped scallops that give a very peculiar physiognomy to the town, although they seem to be but a variation of the roof-lines with raised corners seen in mud construction in the nearby suburbs of Sana's and Bani Husaysh. Alabaster in fan-lights is still abundant enough but many houses have replaced it by *takhrim* of usually banal standards. A white plastered contour around the windows is also common. Examples of this usually follow simple design with a peaked arch or just a mark in the place of the keystone, very similar to the designs still found in the Jewish quarter of Sana'a. There are concentrations of houses almost totally built of mud bricks, in which stone is used only as a raised foundation. They are adorned with a variety of ventilation and light holes, circular and quadrangular, combinations that bring to mind similar constructions in and around Yarim, much further south. The Turkish presence is still evident in stone houses with latticed projecting casements (Taqa Turki as it is locally known) of very sober but pleasant design. Wood-latticed shutters also appear in mud constructions, but of a type identical to that of the Jewish houses of Sana'a. The villages nearby are either built totally in stone (mostly dark limestone) or a juxtaposition of stone and mud, mud being used for the top floor only.

In the last ten years the town wall has suffered severe dilapidation. On the other hand, development outside the walls, that started originally as a quarter off the West gate, has continued as a linear extension to the Hajjah road. In recent years construction has mushroomed south of the Hajjah road, where several community facilities (schools and a health centre) and an army camp have been located. Apparently the army camp itself generated most of this new construction activity since housing facilities were needed for troops stationed there and their families. Stone is still used but concrete-frame and cement-block houses are now greater in number. Linear development along the Sana'a-Saa'da road is less important.

A new cement factory that opened south-west of Amran is expected to bring several thousand dwellers. It is already responsible for the first evident drawback of industrial development: pollution. The Secondary Cities Section of the Ministry of Municipalities has prepared a physical development plan, a document that reflects the urgency of creating a street network and land use plan as a means of rationalising expansion and the concession of building permits. The plan is based on a population forecast of 30,000 people by the year 2000 (1982 estimated population, 9,000), and the assumption that Amran will be a major industrial and trading centre for the highlands. The plan takes into account the importance of preserving the walled town and protecting its integrity in relation to its environment.

Kohlan

Zohra Marabet

Driving down from the high plateau of al-Ashmur to Wadi Seres, the major regional wadi, one can see the *husn* of Kohlan perched on an oddly striped black and pink cliff called Kataᶜat ᶜIzzan; the town looks like a piece which has fallen from the major plateau of al-Ashmur.

Until one drives around Kataᶜat ᶜIzzan, the town appears to be small; then one suddenly discovers the astonishing sight of tall buildings tightly huddled together, covering the northern slope of the mountain and overlooking from a thousand metres above the wadi system and the midlands of the al-Sawd district.

The town of Kohlan surprises the visitor with its apparent quietness. Only on the day of the market, which is mainly an agricultural market, the lower part of the town is filled with the sounds of horns and motors which symbolise for Yemenis the new life-style. What used to make Kohlan an important centre — the coffee trade, an administrative status as *qada* centre, and being a station along the old Hajjah-Amran road — have more or less disappeared. Coffee cultivation has declined; Kohlan is only a *nahiya* centre (district), and the new asphalt road bypasses the town through the southern slope of Kataᶜat ᶜIzzan. It has, however, become one of Yemen's most important tourist attractions with its spectacular location and its well-preserved historical buildings.

In 1216, the Imam Abdullah ibn-Hamza, whose capital was Dhofar/Dhibin (northeast of Amran), put his brother Amir Yahya ibn-Hamza in charge of setting up a new administrative centre in the highlands west of Amran in order to control the area and collect the taxes. It is not known whether the strategic site of Kohlan, which the Amir chose, had some construction on it already or not. One can only say that the *husn*s and the *hukuma* buildings which are standing today are dated from the period of Amir Yahya ibn-Hamza. The Qadi of Kohlan mentioned that some stones with Himyaritic inscriptions had been found at the location of al-Husn and below the *suq* but there is no historical mention of the town of Kohlan before the thirteenth century. There is only mention of Husn al-ᶜAffar, a Himyarite site south of Kohlan and part of the district. The Amir made the town the centre of the *qada* which then extended to include the Hajjah area. During his rule of about forty years, he had the walls of the town built and when he died he was buried in his mosque, al-Amir mosque, next to the *hukuma* buildings. His tomb, with its carved inscription on wood, is a significant example of Dhofar/Dhibin tombs dating from the same period.

With the arrival of Zaydi Sayyads, Kohlan town became the *hijra* of the Kohlan tribe, the tribe of Bani Shawar ibn-Gudam (whose tomb lies on the top of Jabal Din also called Jabal Gudam) in the Hamdan region. It belongs to the Hashid Confederaation but due to its peripherial position, it has not been intensely involved in the Hashid tribal conflicts.

The town is still the *hijra* of this small tribe (today it can only rally 4,000 men in cases of conflict). There are no records of significant historical tribal actions and one wonders if it has been simply overshadowed by the regional Zaydi history or whether they had such a prosperous agricultural income that they kept busy through centuries with hoes rather than with arms.

The *suq* developed steadily by attracting the agricultural produce of the surrounding mountains and wadis; it also attracted merchants from the Sana'a and Hajjah region who were marketing coffee throughout Yemen and exporting it from the ports of Aden and Hodeidah. Taxes on coffee reached twelve tonnes of coffee per annum in an average year which meant that a hundred and twenty tonnes of coffee came through the Kohlan *suq* annually. In addition, the traditional trade of wheat and sorghum flourished. The majority of the inhabitants of the town, who were tribal men and therefore would not get involved directly in trading activities, were prosperous landowners whose coffee crops were being farmed by the lower-class inhabitants of the wadis under a share-cropping system. The wealth thus generated allowed the inhabitants to take care of their town and its defence without depending on the Imam's army. Even during the two Turkish occupations, they managed to confine the Turks to the village of Beit al-Wali, south of the town.

Of the Zaydi rulers of the town, few left traces of their stay besides Yahya ibn-Hamza. The Imam Hadi ibn-Sherafeddin lived in the town and built al-Hadi Mosque where he was buried in the seventeenth century. In 1924, the ruler of the town, Yahya Shayban refused to move the Hajjah as ordered by the Imam Yahya. Consequently, an army was sent to fight the rebel, and after his defeat, the centre of the *qada* was transferred to Hajjah.

Despite its change in status, the town retained its importance because of the taxes it generated. Thirty years ago, Imam Ahmed built the Ahmed Mosque and a *samsarah* (shelter for travellers) which is currently used as a health centre.

After the revolution, the town lost its political as well as its economic importance. The government no longer allo-

Kohlan.

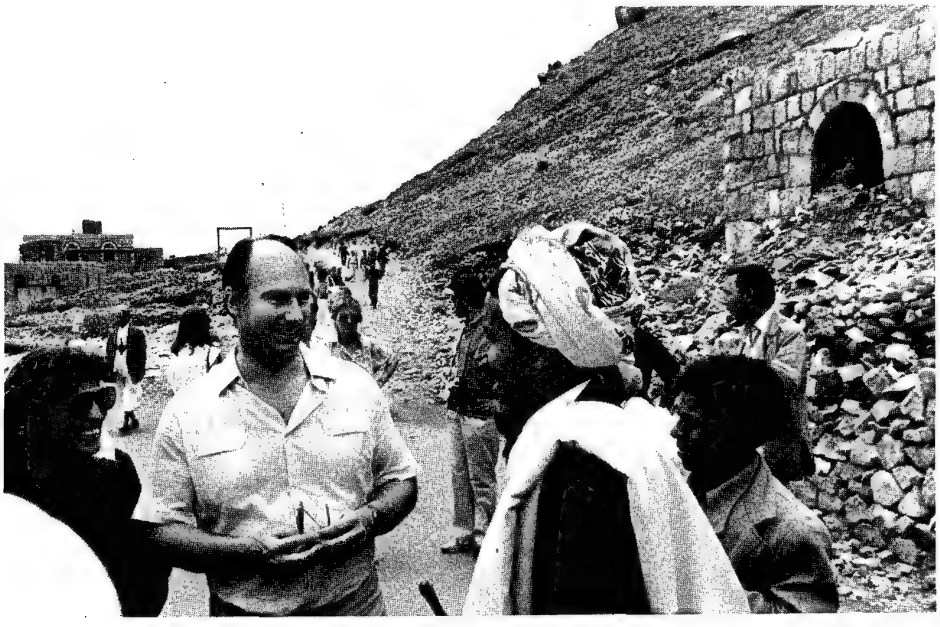
Photo: C. Little/Aga Khan Awards.

cates a budget for the repair and maintenance of al-Husn; as a consequence it is rapidly deteriorating. About a quarter of the town's population has migrated to towns such as Hajjah, Amran and Sana'a.

The inhabitants have made efforts to improve the condition of the town by constructing a sewerage network and roof rainfall catchment systems in each house to increase the domestic water supply of the town. However, because of its limited economic prospects and the costly restraints posed by its existing physical plant and its unusual geographical location, the town is doomed to lose more and more of its population in the future.

Acknowledgement

Most of the historical references have been kindly provided by the Sheikh of the town, Hassan ibn-Rajeh al-Morashi and the Qadi Ahmed ibn-Homayd, Head of the Waqf of Nahiya Kohlan, to whom we are most grateful.



Kohlan. His Highness The Aga Khan on the site visit in Kohlan.

Photo: C. Little/Aga Khan Awards.

Hajjah

Zohra Marabet

In view of its place as one of the largest and most developed among the secondary towns in Yemen, it is surprising to discover that Hajjah is not older than a hundred and fifty years.

Its remote western position in the highlands prevented it from becoming a state-organised centre under the Zaydi imams for a long time. The earliest historical mention of the site is found in the fourteenth and fifteenth centuries when Imam Idris visited the area of Hajjah. At that time there were a few villages where the town is presently located, and a *suq* which pointed to the prosperous commercial activities resulting from the cultivation of coffee in the area. The *suq* of Hajjah, adjacent to a Jewish village, had been fairly well-developed. The combination of the village and the *suq* fulfilled all the trading needs of the tribesmen. Al-Kula'a, a citadel which dominates the *suq*, must have been built later, probably after the first Ottoman occupation.

Development began in the town with the second Ottoman occupation and the uprising of the Hamid al-Din dynasty. The traveller and geographer Glaser reported in 1884 that the Turks were putting a great deal of effort into the development of the town and that they had built a hospital as well as barracks. However, in his notes he described the town as consisting chiefly of the *suq* and a few satellite villages.

During the rule of Imam Yahya (d. 1948), the town was given special recognition because of its support of the Hamid al-Din family and its participation in the overthrow of the Ottoman occupation. It was made the administrative centre of a *qada*, and the future Imam Ahmed, son of Yahya, was named the amir of the *qada*. He became popular among the inhabitants because he implemented several measures for the improvement of the town.

In 1944 Hajjah was made the capital of the province. It proved to be the refuge and the stronghold of the Hamid al-Din dynasty during the two attempted coups that occurred during Imam Ahmed's rule. At the same time, somewhat paradoxically, the town also became a major centre of activity for dissenters. Revolutionary literature that stirred up the republican spirit among the people of Yemen was written by the opponents of the regime who were kept for years in the prisons of Hajjah, and it is from this town that such revolutionary literature was disseminated throughout the country.

For several years after the revolution, the town had Mujahed Abu Shawarab, later Deputy Prime Minister, as governor. During his administration major development projects were begun. These involved street planning, waterworks, electricity supply, the building of schools and a hospital, the construction of the Amran-Hajjah highway. In contrast to other major population centres in the Yemeni Highlands, Hajjah is thus a very recently-developed urban settlement.

Jiblah

Barbara Croken

The city of Jiblah was founded at the end of the eleventh century, and reached the apex of its political and cultural development as the capital of the Sulaihid state during the rule of Queen Arwa, in the early twelfth century A.D. Founded on the spot where a Jew named Dhu Jiblah made pottery, the place was known as Dhu Jiblah throughout the medieval period. The original city was built by Abd Allah, son of Muhammad, brother of Ali ibn-Saba who founded the Sulaihid state. After Ali died he was succeeded by his son al-Mukarram, the husband of Arwa. For reasons which remain obscure, it is clear that it was Arwa and not al-Mukarram who governed the Sulaihid kingdom. It was Arwa who decided to move the royal residence from Sana'a to Dhu Jiblah and to construct the capital there.

As the Sulaihid capital, Dhu Jiblah flourished and became a centre of Islamic studies, with special emphasis on Ismaili philosophy. The Sulaihid state maintained close relations with the Fatimid Imam in Egypt, and profited from the commerce in the Red Sea through its control of the port in Aden. The Sulaihids ruled most of what is currently North and South Yemen combined.

The reign of Arwa is famous as a time of great prosperity and cultural florescence. The Queen supported industry and commerce, and improved the road network all over the country. Many mosques and palaces were built in Jiblah under Arwa's reign, and some of these are still extant. The Great Mosque, for example, was built by Arwa in 1088, on the site of the original royal palace. The mosque remains to this day in excellent condition, and contains the tomb of the beloved Queen. The Dar al-Sultanah, remains of which exist today, is reported to have been her royal residence.

The city stands between two mountain streams which run with water all year long: Sa'ilat al-Halid to the north, and Sa'ilat al-Ta'bar, which runs from the fortress of al-Ta'kar and intersects Sa'ilat al-Hadid just south of the city.

The population of modern Jiblah is around 20,000. The city has thirty-seven mosques, five of which are exclusively for women. Several girls' schools and a religious institute for girls maintain the tradition of education for both sexes in the city which produced the only Queen known in Yemen during the Islamic period.

Jiblah is the administrative centre of a district (*nahiya*) which includes twelve *uzlah*s, containing 350 villages, with a total population of nearly 100,000. The whole district is in desperate need of financial assistance to complete the development projects which will provide the infra-structure for water supply systems, roads, schools and health clinics needed by the population. The major concern of the citizens in Jiblah today is to improve their water supply. The construction of two new cisterns would relieve the situation, one to the west and one to the north of the city.

The citizens of Jiblah today display the same predilection for commerce and industry as they did in Arwa's time. Hopefully it will not be long before the fruits of their endeavours will be adequate to finance the development of the district and the restoration of the city's monuments.

Manakha

Tomas Gerholm

Manakha is one of the best known of the smaller towns of Yemen, having been described by many of the travellers visiting the country at a time when the journey was a difficult venture. It is situated on the western escarpment, just off the artery of Yemen connecting Sana'a and the highlands to Hodeidah and the sea. It is a minor commercial and administrative centre in a rural district inhabited by members of the three main schools of Islam in Yemen: Zaydis, Shafi'is and Ismailis. The town has a fairly homogeneous population drawn from all parts of highland Yemen, with rather few additions from the lowlands. Until the foundation of the state of Israel, Manakha had a sizeable Jewish minority. At least ten per cent of the roughly 3000 people living in Manakha during the first half of this century were Jews. The Turkish soldiers stationed in Manakha during the last Ottoman occupation of Yemen have left many descendants. Needless to say, they are completely integrated into Yemeni society. The various development efforts of the last few years have given rise to a small German colony residing in the town. The recent revival of religious instruction has brought teachers not only from Egypt but also from Syria, Jordan and the Sudan. For more than a decade, Manakha has been one of the "musts" on the tourist maps of Yemen. Considering all this and the number of Ismaili pilgrims from all over the world who pass through the town on their way to the holy places on Jabal Shibam, one cannot but conclude that Manakha, although it may seem to lie in the midst of nowhere, is a surprisingly cosmopolitan place.

By Yemeni standards Manakha is a fairly new town. It is not mentioned by al-Hamdani in his tenth-century description of Yemen. The locals themselves claim that the city was founded some four hundred years ago when settlers on the top of Jabal Shibam moved down from their fortified village to the pass where Manakha now lies, and where previously there was only a small Jewish village on the track winding across the mountains from Hodeidah to Sana'a. When Carsten Niebuhr led the famous Danish expedition to Arabia Felix in the 1760s, Manakha was apparently already a lively commercial centre. He did not see the town himself and mentions only the grapes of the area, but according to the present-day town-dwellers coffee was then the mainstay of Manakha's relative prosperity. Manakha was also the administrative centre of the Haraz region: a representative of the Imam in Sana'a was stationed there to supervise taxation, administer the law and keep the peace. Tribal organisation was probably, like today, rather weak, but sectarian differences provided an alternative framework for local politics. At times, when the central authority of the Imam in Sana'a was in eclipse, Manakha was ruled by the local leader of the Ismailis.

In 1872 the Ottoman forces, which had been holding the lowlands along the Red Sea coast for about two decades, advanced into the mountains and conquered most of Yemen. Manakha, approximately half-way between the highland plateau of Sana'a and the sea, was made into a strategic garrison town. The Turks remained for almost half a century and put their imprint on the town by constructing a number of buildings that deviated sharply from the Yemeni style of architecture: the government house, the telegraph office, the citadel with its granary, the military hospital (which is now an institute for religious instruction) as well as the various fortifications on the peaks above the pass.

In the beginning of this century, the Imam's persecutions of the Ismaili minority caused large-scale emigration to India and East Africa. The commercial success the Ismailis achieved abroad later tempted the Zaydis, and to a lesser extent the Shafi'is, to follow suit. Haraz became an area of intense out-migration long before the present labour migration to Saudi Arabia. Since the revolution of 1962, many of these merchants have returned, primarily from Ethiopia, to become important figures in the commercial life of Manakha and later on in Sana'a where they dominate an entire street next to Bab al-Yemen.

The town has remained, throughout most of its history, a commercial node of great importance both for long-distance trade and for the regional network of weekly market places. But the economic position of Manakha has been adversely affected by the completion of the first modern road in Yemen, the one connecting Hodeidah and Sana'a, built by the Chinese during the year immediately preceding the revolution. The new road by-passes the town, and much of its commercial life has consequently been displaced to a small settlement, al-Maghraba, located on the new road. This change, in conjunction with a prolonged drought in the early 1970s, made many members of the commercially active families leave Manakha for Sana'a or Hodeidah. By 1975 Manakha seemed to be a dying town.

Today, however, Manakha is a much livelier place than one would have predicted eight years ago. The Sunday market attracts a large number of visitors. New buildings are going up everywhere on the deserted terraces around the town which used to be green with sorghum. (Now imported wheat is supplanting local crops, both wheat and sorghum.) A second hotel is under construction. The town has already got a small health cen-

tre with an Egyptian doctor and a German mid-wife, and a hospital was nearing completion in late 1982. Electricity is available for the town itself, and the network is gradually spreading throughout the rural areas. The major change, however, has been the extension of simple roads for four-wheel-drive vehicles so that most villages can now be reached by car. The number of cars in the area has risen dramatically and this has made possible an ambulating life which seems strangely familiar to a European: work or study in the city of Sana'a or Hodeidah is combined with weekend trips to the home villages where women, children and the aged continue to live in a slowly dying peasant society.

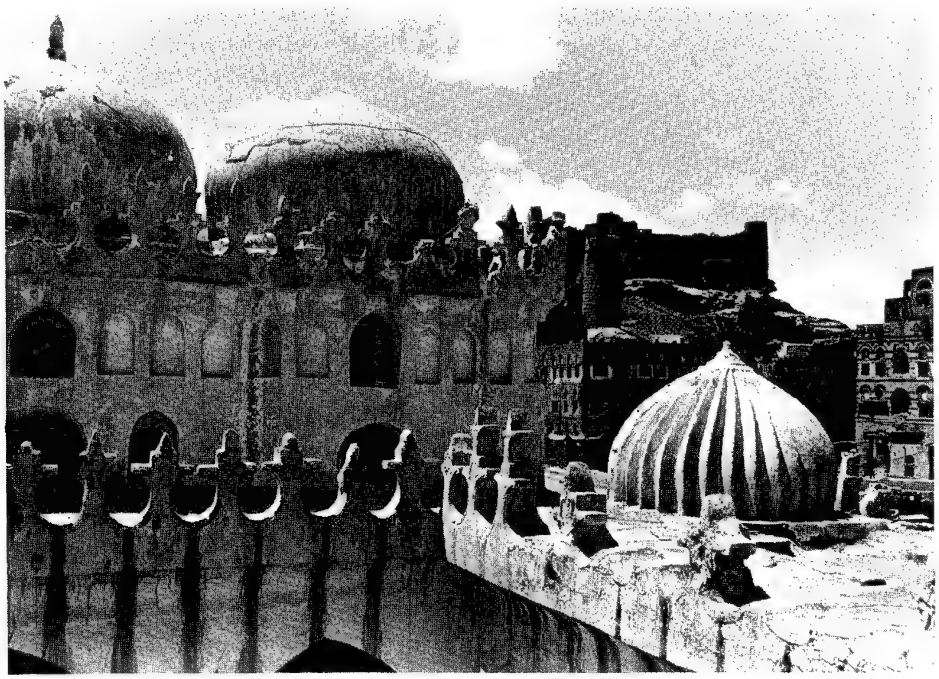
The economic basis of this spectacular transformation is the labour migration to Saudi Arabia (which, according to calculations, involves one-third of the adult male labour force in the country). It has made possible an ever-growing influx of modern consumer goods and a shrinking reliance of Yemeni products in all fields. Many signs indicate an end to this economic boom, but it is difficult to foresee the consequences for Yemen.

In the short run, however, prospects for Manakha seem good. It has now a Local Development Board which appears to be functioning efficiently after several false starts in the early 1970s. The electrification programme has already been mentioned. In addition, there is a water project carried out by a German company which will bring piped water to the town from the wadi bed some 500 metres below. German experts are also carrying out an ambitious reafforestation programme on the barren slopes of the Haraz massif, both to halt erosion and to provide the farmers with a new cash crop.

On the architectural side it should be mentioned that the new hospital is said to be built in the "official" Yemeni style, so well known from the examples in Sana'a. But private buildings are erected without any consideration for the architectural heritage of Yemen. The two gas stations are only the most obvious examples confronting the visitor right on the threshold to Manakha. In addition, tin sheds and a new range of colours are rapidly changing the visual impact of this town which has always been a meeting-place for local style and foreign influences.

Rada'a

Selma al-Radi



Rada'a.

Photo: C. Little/Aga Khan Awards.

The area of Rada'a has a long history dating to pre-Islamic times as evidenced by the numerous sites (historic and prehistoric), ruins, dams, inscriptions and graffiti that abound in the surrounding countryside. In pre-Islamic times the region lay between the ancient kingdoms of Radman and Himyar; it was therefore an important focal area with contacts to the east, south, north and to the immediate west.

The town of Rada'a also owes its origin to pre-Islamic times when it was probably located to the north of the present day town. The imposing citadel, built on a natural outcrop rising above the plain, is pre-Islamic in origin but has seen much change and has been remodelled and enlarged in the intervening periods. Today the town spreads out along the plain at the foot of the citadel. Its main western gate still stands, together with sections of stone wall.

Although the town's public spaces are somewhat neglected, the external aspects of buildings show concern for their outward appearance. Most of the architecture is of mud, although stone may be used for the ground floor, and there are some buildings (mostly governmental) built wholly of stone and brick in adapted styles. The quality of mud construction is refined, including brickwork in the mud walls both as a structural element for the arches of openings and for decorative purposes. Most window fan-lights are made by double or triple arches, each containing the largest possible single plane of alabaster. The double arch with alabaster above the windows and the fusion of mud and brick in construction and ornamentation are the most original elements of the local architecture in Rada'a.

During the early part of the Islamic period and with the westward shift of power, Rada'a was neglected and became a backwater town. It remained so until the fifteenth century when it emerged under the Tahirids. This short-lived but dynamic dynasty, which took over the lands of the Rasulid kingdom, was responsible for numerous building projects including the water system in Aden and madrasas in Zabid, Juban, Muqranah (their capital city) and Rada'a. It was the last king of the Tahirid dynasty, Sultan Amir ibn-Abd al-Wahab (according to a legend the first in Yemen to die of a bullet fired by the invading Mamluk troops in 1517) who began to build the Madrasat al-ʿAmiriya in Rada'a in 1504 A.D.

The madrasa is two-stories high with the prayer hall and the study sections on the first floor while the ground floor consists of small shops on the exterior and large vaulted rooms in the interior. The inside of the prayer hall is almost entirely covered with painted geometric designs, stucco inscriptions and painted plaster work. The whole building measures some 23 by 40 metres. The madrasa was purposely neglected by the Zaydi imams that followed the Shafi'i Tahirids, and its *waqf* lands and records were confiscated. Initial repair work is now being carried out by the Directorate of Antiquities, the Ministry of Awqaf, and the Dutch Government.

Shibam

Fernando Varanda

According to tradition, Shibam (or Shibam Aqyan as it appears in Himyaritic inscriptions) was named after a local notable, and its original name of Yahblis was thus changed. In the third century A.H., Shibam was the seat of the Yu'firids, the first local dynasty in Yemen that eventually extended its hegemony all the way to al-Janad, near Ta'izz. Tradition has it that the Great Mosque was built in this period by Muhammad ibn-Yafur on the site of and with material from a Himyaritic palace. The well-preserved mosque is the only testimony to the past grandeur of the town which was then walled with four gates and had a strong fortress. Owing to its control over the surrounding populous and fertile valley, and over the mining of silver and semi-precious stones there, it boasted of large markets.

The fortress is situated on a small elevation, the Lubakha, whose slopes are perforated by man-adapted or man-made caves traditionally attributed to the Himyarites. They may have been tombs or granaries, but many have remained in use as temporary or semi-permanent shelters. Their last massive occupation was during the civil war as a refuge from bombings.

The architecture of Shibam appears plainer than that of its neighbours, Kawkaban and Thula. Many houses have pre-Islamic stones incorporated in their construction. The major characteristics of their facades are inlays and fan-lights made of alabaster and set in stone frames that are round, double round, or round with two arches. The latter motif also appears in the Great Mosque, but with different proportions. The majority of the windows seen today, however, have fan-lights with a single arch and *takhrim* (gypsum fretwork with coloured glass), following a trend wide-spread throughout the country.

While it has been at the centre of Yemen's history for most of its history, whatever importance Shibam has today comes from its position as a regional market. The heritage of the various rural markets that were once enclosed within the town's limits.

Today, the town is divided into two parts. The older part, within the perimeter of the walls (which are now broken here and there and with much encroachment from houses) starts at the market, branches from the main gate to the side streets, and narrows toward the Great Mosque. The new part continues from the same gate to the outside of the walls along the road where can be found a flourishing market. The "interior" market is characterised by rustic colonnades made of thick stone disques evoking the archetypal forms of the columns of the Great Mosque. In the "exterior" market, besides the commercial stalls, there are a growing number of workshops that cater to the needs of builders: a *takhrim* maker, a carpenter and the like. The fringes of the market are quickly being filled with houses spreading along the walls; these houses are made of lava stone and in a style that is becoming wide-spread throughout the country. The major decorative feature is the fan-light made of a single arch with *takhrim*.

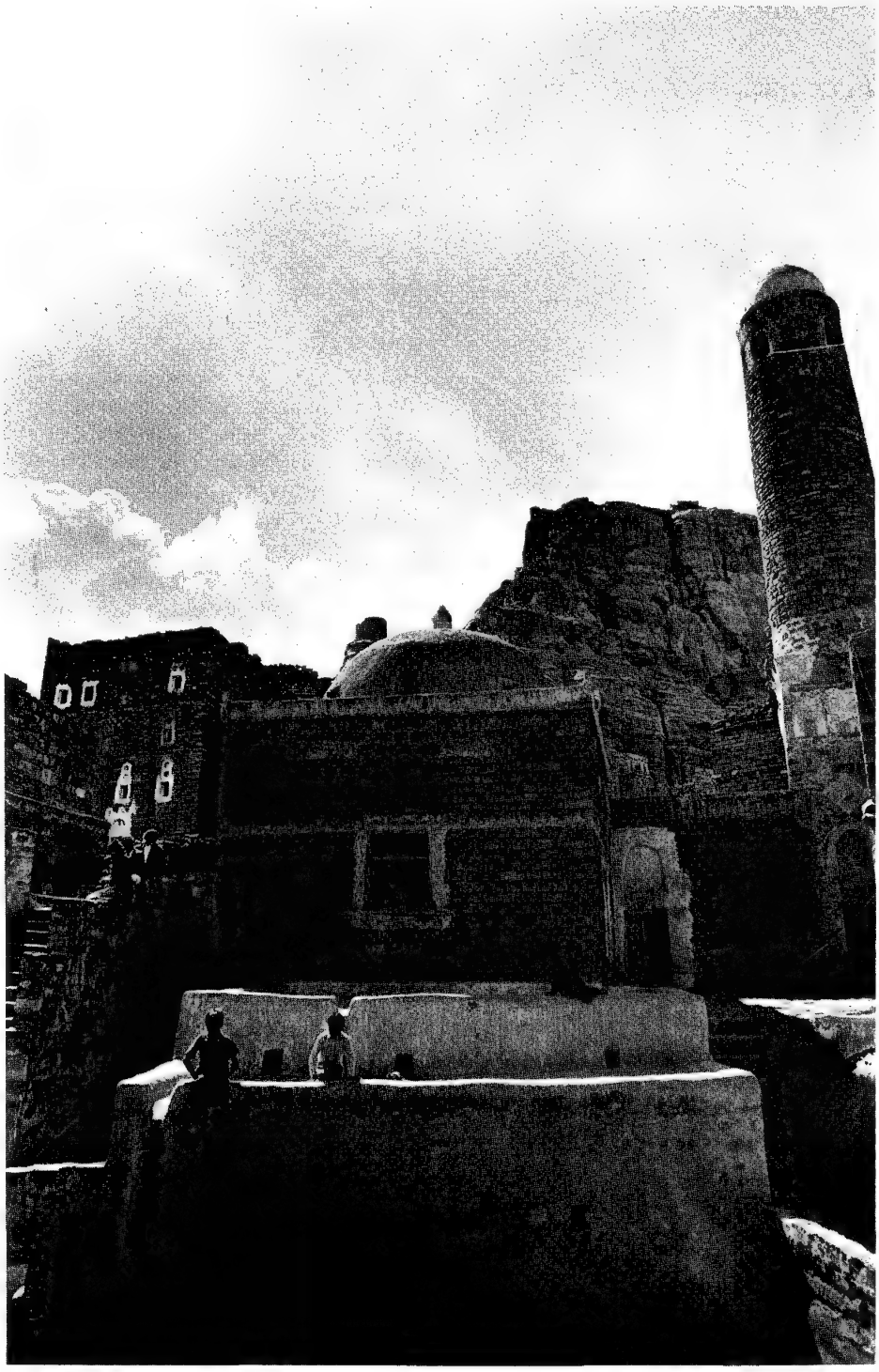
Major new construction in the new part of Shibam consists of public buildings: schools, a hospital, local administration headquarters and the new power plant. Electricity and piped water are the most recent improvements.

Wadi Dahr, adjacent to Shibam.

Photo: C. Little/Aga Khan Awards.

Thula

Fernando Varanda

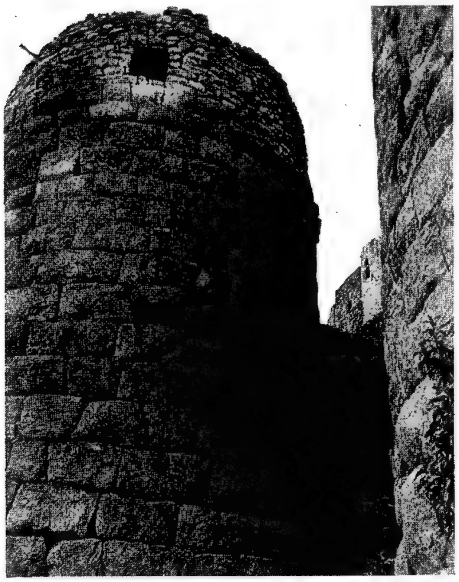


Thula.

Photo: C. Little/Aga Khan Awards.

Of the triad of towns called Kawkaban, Shibam and Thula, the latter is the largest and is the one that has survived relatively intact. Thula lies at the bottom of a cliff and is circumscribed by a stone wall with bastions and four gates, one of which still displays a "labyrinth" for entrance control. On the top of the cliff was the citadel — fort, palace, mosque, granary pits and cisterns — and a cemetery containing the tomb of a holy man (*wali*). The citadel, once known as the "Castle of the Raven", was considered one of the finest in Yemen until the Turks destroyed all the outer works. The town is linked to the citadel by a path carved in the side of the cliff, similar to, but shorter and easier than, the path between Shibam and Kawkaban. The mountain side and the top of the cliff have many caves, some of which are still used by the local garrison and are elaborately adapted for permanent use, having plastered walls, niches, wood-framed openings and so forth.

According to the eighteenth-century traveller Niebuhr, Thula had control over 300 villages in an area extending to the mountains north of al-Bawn and reaching the slopes of Shahara. The town actively participated in the struggles for power that have been characteristic in Yemen's history. It engaged in local feuds as well as standing up to challenges from outside forces. In the seventh century A.H. a Zaydi Imam became the ruler, fought the



Thula.

Photo: C. Little/Aga Khan Awards.

Rasulid power in Sana'a, and temporarily gained control over Sana'a and Dhamar. In the tenth century A.H. Thula was included in the defence belt to contain the Ottoman invasion. If Kawkaban might be described as the sentinel of the region and Shibam the market place, then Thula is certainly the "bourg", an oasis of wealth that managed to ride the crest of the wave of wars that swept its neighbours. The town maintains relative importance today as the seat of an administrative district (*nahiya*) under Sana'a, whereas Shibam and Kawkaban have been incorporated in the *nahiya* under al-Tawila in the province of al-Mahwit.

The architecture of Thula boasts some of the most refined examples of stonework in the country. This is due not to smooth finishing but to the wide use of a variety of stone decorative elements. The stone used is a yellow flagstone cut into blocks smaller than the usual size in Yemen, having a face size of 10 x 25 cm. The tall buildings of four to five storeys often do not have a regular shape, but seem to adapt themselves to the flow of alleys and streets. Projecting upper floors are common and offer clever solutions to the articulation of the facades at different levels. There are also houses with roof courts and light wells, similar to those in Kawkaban and other areas of the country.

The most characteristic features of external decoration are friezes along the floor and roof lines, vertical inlays around the openings, and fan-lights in various combinations of circles, arches and inverted drops. There are also buildings that display the severe design of fan-lights associated with archaic provincial traditions found elsewhere (e.g., in Shahara). Houses with roof courts and light wells are associated, in the local tradition, with the oldest styles. As for interior decoration, it is the carpentry of windows and doors that is most sophisticated, with carvings and mother-of-pearl inlays.

The homogenous building style of Thula had already begun to disappear in the 1970s. New buildings — such as the second outside the walls or the houses within the walled perimeter — were being erected according to techniques common to stone construction throughout the country and influenced by the major urban centres and by itinerant labour which identified with new entrepreneurial systems. The use of coloured glass *takhrim*, however, is found with fretwork of minute designs and strong colours similar to the oldest types in Sana'a and al-Tawila.

The construction that has taken place outside the walls is limited to 40 or 50 scattered houses and a row of workshops on either side of the road from Sana'a to the main gate. A major road, however, is planned and will contour the town close to the walls, connecting Thula with al-Miswar and, eventually, Amran. Consequent development is expected to occur, and the Secondary Cities Section of the Ministry of the Municipalities is preparing development plans with policies of conservation for the walled town and controlled expansion to the plateau north-east of the town and the flats toward the south, but protecting the agricultural fields in the adjoining valleys. Public utilities have been recently introduced.

Kawkaban

Fernando Varanda

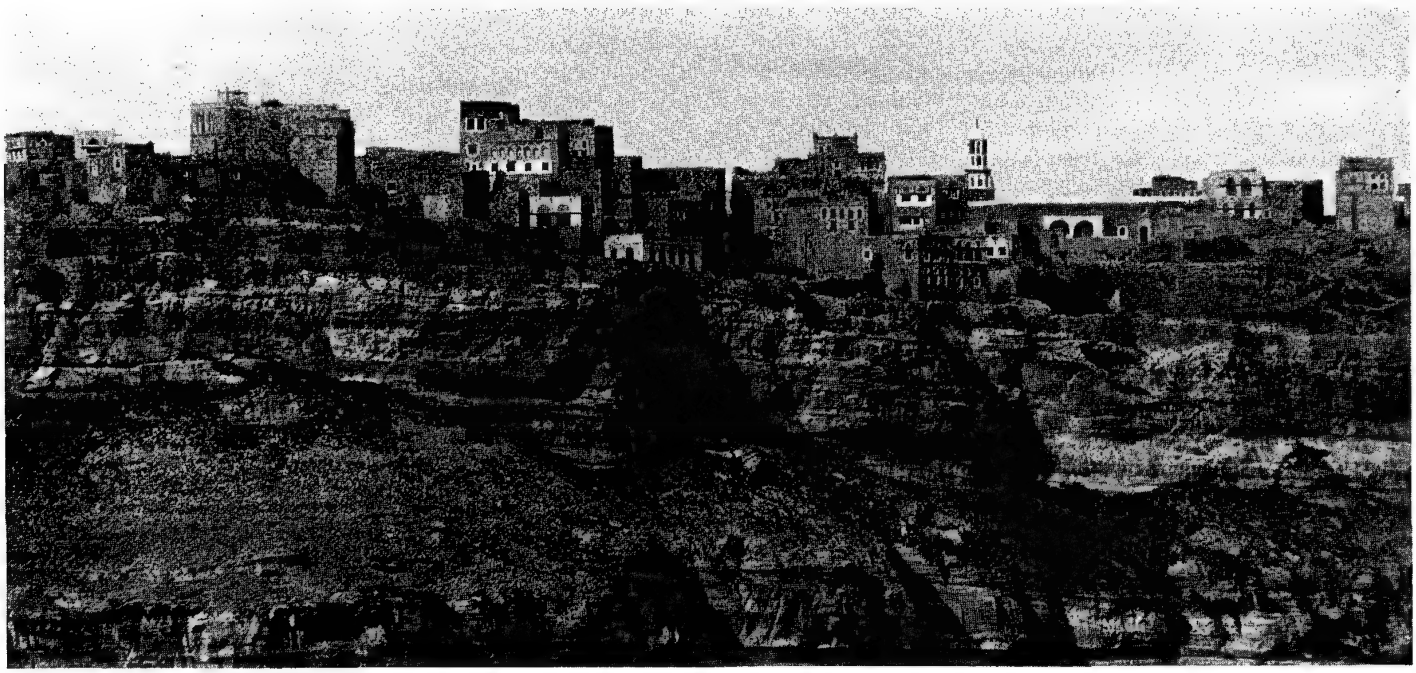
Ancient seat of a kingdom, capital of a province until the Republican revolution, and literally deserted since then, Kawkaban sits on the edge of a steep cliff (at the foot of which nestles Shibam), dominating the valleys and hills from beyond Thula to the plains of Sana'a. The town stretches along a ridge from a gate, Bab al-Hadid, that can be reached from Shibam by a stone path of steps carved out of the cliff.

The origins of Kawkaban go back to the Himyarites. The oldest part of the town, or what is left of it, coincides with the ancient stronghold referred to by al-Hamdani. An impregnable place until the advent of aeroplanes, Kawkaban was important for centuries as the capital of the imams of the same name. Shibam held many lands and important towns (including Hajjah, Tawila, Mahwit), and maintained its independence both from the imams of Sana'a and from the Turks until its capitulation during the second Turkish invasion. It was a stronghold of the Republicans during the Civil War of 1962.

The destruction caused by war and abandonment has greatly ruptured the urban fabric of Kawkaban, but one can still see that large open spaces were included within the perimeter of the walls: in particular, a central square which has the main mosque as one point of reference and, as another, the administration house. This may have been due to the town's role as a refuge for nearby villages, one capable of resisting long sieges; hence, also, the granary pits and cisterns able to support a population that might swell to three times its normal size.

The houses are sturdy, quadrangular standstone constructions, three to four storeys high. Detached buildings in walled compounds are found, as are buildings with roof courts and light wells for the floors below, a feature that is also found in Thula, in the regions of Sa'ada, and Dhamar.

In the decoration of facades, elements appear that are of a tradition common to remote areas of the country (e.g. Khuban) such as friezes and flower-like inlays



Kawkaban.

Photo: C. Little/Aga Khan Awards.

made with square stones disposed as lozenges. The strongest designs, however, are part of a vocabulary that extends its influence all the way to Mahwit and has its most striking expression in Thula. The quality of the stone itself — sandstone with pink or grey tones — probably contributed to the comparative restraint of inlays around windows, friezes along the floor and roof lines, and fan-light designs. In more recent buildings, decorative treatment has strong affinities with the style current in Tawila. Some very good examples of plaster carving and woodwork in interiors were observed in the very dilapidated houses of the imam.

The market, which is of fair size and multi-linear, widens as soon as the walled precinct encircling the gate is crossed, and narrows as it approaches the square and the mosque. At the eastern end of town is a cluster of small houses and an isolated row of market stalls, now abandoned, that formerly served the Jewish community, at a walking distance of some 20 minutes from the town.

The recent opening of a motor road to Kawkaban and the introduction of modern utilities (electricity and telephone, but not, as yet, piped water) are causing an increase in new construction, in some cases super-imposed on the old structures. Some of the old houses have been externally plastered, apparently to consolidate loose stones, with green-dyed cement. A new school was built in the stretch of the square adjoining the main mosque, obscuring the former relation of the mosque to the square.

The new buildings, including the school, have little to do with the appearance of historical Kawkaban. The stone used is white lava, and black lava is used for simple decorations. Lava is quarried and brought in by lorries. Openings are, in general, large windows that have become popular in the last ten to fifteen years, with *takhrim* fan-lights. To date, there is neither an official programme for the development of the town nor for the conservation of its unique characteristics.

Yemen Arab Republic: The Construction Industry

Derek Miles

The following are excerpts from a report kindly made available to the AKAA by the Central Planning Organisation, Sana'a. It was written in 1981 and offers the most extensive appraisal of the construction sector in the YAR. Mr Salah Shehata and Mr B. Kulkarni were instrumental in assembling the data contained in the report.

Description of the Construction Industry

The Public Sector

Prior to the 1962 revolution and during the civil war that extended up to 1970, all public sector construction was the direct responsibility of the Ministry of Public Works (MPW). Before 1962 the only paved road in the country was the one connecting Sana'a with Hodeidah. There was no electricity, water, sewerage or other municipal services, no schools (other than the traditional *kuttab* religious schools for boys only), and no hospitals or health clinics. Thus the government was faced with the massive task of developing from scratch a national infrastructure and civil administration. It therefore invited a number of international, bilateral, religious and humanitarian organisations to assist in the socio-economic development of the country. The funds that became available for construction rapidly outpaced the limited resources of the technical and administrative staffs of the MPW.

As a result of understandable concern for the achievement of physical results and frustration at the limited implementation capacity of the MPW, various ministries and public agencies became directly involved in designing and commissioning construction projects by establishing their own technical departments, engaging foreign consultants, supervising tendering procedures and generally managing projects. Similarly, bilateral agencies began carrying out many projects with a minimum of government involvement. With government encouragement, the Local Development Associations (LDAs) began grass roots development activities at the village and provincial level, constructing schools, water supply systems, health centres and feeder roads.

The government established the Central Planning Organisation (CPO) in 1972 to create an efficient institutional arrangement for planning. In spite of the experience gained from the first Three-Year Development Plan (1973-1976) and the much improved Five-Year Plan (1976/77—1980/81), planning and implementation capacity in the YAR remain severely limited. Construction activities in both the public sector and the parallel semi-official sector lack co-ordination and clarity in overall organisation. The efforts of the small Yemeni and foreign staff of the CPO during the short time since its inception are commendable. But the continuing deficiency in dependable basic statistics (which is only now gradually being ameliorated) make planning and forecasting difficult.

Following the revolution, and especially since the national conciliation in 1970, governmental institutions have been expanded and modern administrative procedures have been progressively introduced. The first development programme and the subsequent Five-Year Plan were significant improvements over the situation that existed before. However, being so very recent and alien to the traditions of the people, co-ordinated national planning will require time and persistent efforts on the part of the government to be accepted as a rational framework for overall development.

The following public sector organisations have been identified as being directly involved in the construction industry:

Central Planning Organisation (CPO): Instrumental in allocating foreign and local financial resources; also acts as the government's executing agency for certain construction projects.

Ministry of Public Works (MPW): Design and supervision of construction and periodic maintenance of public buildings, most rural water supply systems, and highways and ports through the Highway Authority and Ports Authority, respectively.

Ministry of Economy: Construction of industrial estates; licensing of industrial projects including those for the production of building materials; encourages housing development through the Housing Credit Bank (HCB).

Ministry of Power and Water: Construction of national grid and city power supply networks and the water supply and sewerage systems in the major cities of Sana'a, Hodeidah, Ta'izz, Ibb and Dhamar, through the Yemen General Electricity Corporation (YGEC) and the National Water Supply and Sewerage Authority (NWSA).

Ministry of Municipalities and Housing: Municipal development schemes and, more recently, low-cost housing.

Ministry of Religious Endowments (WAKF): Investments of religious endowments in construction of housing, office buildings and commercial centres.

Ministry of Health: Construction of hospitals, health centres, infirmaries and related buildings.

Ministry of Social Affairs and Labour: Construction of youth centres, stadiums, security posts and related buildings.

Ministry of the Interior: Construction of office buildings, police stations, security posts and related buildings.

Ministry of Communications: Construction of radio and TV stations, telephone exchanges, and cable and wireless links.

Because the procedure followed in implementing projects varies from ministry to ministry and from year to year, comparison and analysis are virtually impossible. Depending on the source of funds — national, bilateral, international or any combination of them — or the complexity of a project, the design, tendering

and supervision of construction may be entrusted to foreign consultants, the MPW, a specific ministry's technical department, or to a government or national organisation or authority.

A special element that further affects public sector construction activities in the YAR is the direct involvement of foreign agencies. Because of the vast need for basic services and the lack of sufficient government personnel to administer available assistance funds, it has been found necessary to authorise some bilateral and joint agencies (e.g. Saudi Arabia, the United Arab Emirates, Iraq, and the Arab Fund) to operate directly with a minimum of YAR Government supervision or control. Some agencies have their own offices in the YAR that directly finance, plan, tender and manage the construction of schools, health centres, mosques, highways, water supplies and general development projects. The contribution of these agencies to the improvement of the living conditions of the rural poor has been substantial, both as a source of employment during construction and subsequently in the form of improved public services. As the country's development needs become better defined, it will be necessary to regulate the activities of these agencies in order to maximise the benefits of their contributions.

The Ministry of Public Works

The MPW remains the central government's main executive branch responsible for public works. It is effectively the parent ministry responsible for controlling and co-ordinating the activities of specialist construction agencies. In 1972, its construction department became the present Highway Authority (HA), which relates to the MPW only through the minister who is also the chairman of the HA. In 1973, the National Water and Sewerage Authority (NWSA) evolved from a WHO/UNDP project for pre-investment studies, for which the MPW was the government co-ordinating agency. NWSA was later made responsible to the Ministry of Municipalities and more recently to the newly formed Ministry of Electricity, Water and Sewerage. Functions of the present Ministry of Municipalities and Housing were also originally fulfilled by the MPW. The MPW continues to be the focal point for government planning and decision-making in technical matters.

The Ministry of Public Works Technical Department

The MPW Technical Department is responsible for the design of building projects undertaken by the MPW and various other government ministries and departments. Design documents are limited in most cases to major architectural drawings and drawings of reinforced concrete works. Electrical, sanitary, carpentry and finishing works are merely described in written notes in the contract documents, and no detailed drawings are available. In December 1980, its technical staff consisted of 13 engineers, two technical assistants and one engineering assistant, all except one of whom were Yemenis. Despite its limited staff the number of buildings designed by this department is substantial.

In addition to design, the Technical Department is responsible for the preparation of tender documents, the evaluation of tenders, the execution of contracts, supervision of construction, and certification of contractors' invoices for interim and final payments. It is not surprising, therefore, that the Department has had to be somewhat ruthless in defining and limiting its priorities, with the result that

- work is limited to buildings only;
- contract and working drawings are limited to a bare minimum;
- a uniform, but inadequate and seriously outdated, set of tender documents is applied to all contracts;
- technical specifications are general and no variations are introduced to suit specific needs;
- bidders are required to make their own quantity take-offs from the limited drawings and take full responsibility for them, i.e., bid a lump sum (unit prices are included only for application to eventual changes in scope of work);
- regular supervision of the contractor's work is lacking; and,
- quality control of work in progress is fragmentary and ineffective.

The number of staff and facilities accorded to the Technical Department is thus effectively unrelated to the number of building contracts they are required to manage, and their limited resources are spread so thinly that they are unable to provide a fully satisfactory service to any of their clients. This leads to general criticism of performance, understandable but often unfair. Another adverse result is the dispersion of resources as other ministries and governmental or semi-public bodies establish their own technical departments or engage foreign consultants.

It was concluded that a basic reorganisation of the Technical Department of the MPW is called for and recommended that the present Technical Department be developed into a general public sector consulting authority. Its services should be available to all ministries and public bodies on a fee basis, i.e., either a fixed percentage of project cost or as a negotiated sum, and it should be authorised to recruit staff to suit its anticipated work load. The central government should bear a proportion of the overall expenses in compensation for general national-level planning and consultancy services, research work, and feasibility studies, for which a specific fee cannot be negotiated. The technical officers now emerging in other departments should be transferred, along with their duties, to this central consulting authority. The authority would also prepare up-to-date standard tender and contract conditions and be a central pool for the storage and exchange of ex-

perience and information on a national level. In addition to the activities of the present Technical Department, the new authority might gradually evolve to take over the job of providing technical input to other relevant government services, e.g. co-ordinated city planning, housing for lower and middle-income groups, rural water supply projects and public health projects.

Foreign Contractors and Joint Ventures

Foreign contractors only started to move into the YAR during the 1970s, and their operations are generally limited to the larger public sector projects. However, Chinese workers have sometimes undertaken minor works such as tile paving in the central network of roads in Sana'a. The Chinese have also undertaken the construction of houses and repair works for the private sector.

Most of the foreign contractors working in the YAR operate on a project-by-project basis, and their operations are directed either from the head office in their home country or from a branch office elsewhere in the region. Projects are usually managed and supervised by expatriate personnel, and equipment and construction materials are often purchased directly by their head office abroad. Apart from the Chinese work-forces, who have successfully employed labour-intensive techniques, most foreign contractors use modern construction techniques and sophisticated construction equipment, and rely heavily on imported building materials and components.

There are currently about 15 foreign contractors active in the YAR, mainly from Europe and the Middle East. However, Korean contractors have recently been successful in obtaining some major contracts including the completion of the large new Central Bank building in Sana'a. Although the quality and speed of construction achieved by foreign contractors is usually acceptable, it appears that bids are sometimes excessively high (even bearing in mind the high cost of labour and other resources in the YAR), and that insufficient attention is given to the transfer of skills to local people at all levels. Some companies retain local Yemeni agents, but these individuals are usually general merchants who lack technical expertise, and their managerial role is limited to contacting clients and seeking invitations to tender. Although some Yemeni citizens have obtained useful on-the-job training in craft skills and as plant operators, it would be preferable if foreign contractors are required to make a formal commitment to the transfer of skills as a contribution to a general apprenticeship scheme.

The activities and approach of the Chinese work-forces differ markedly from those of the foreign companies, but they can also be viewed as "foreign contractors", since they are now bidding in competition with the private sector for general building, public housing, and public works contracts. They have been remarkably successful in competition, largely because their bids are low, they complete their work on schedule, and the quality is acceptable.

The People's Republic of China sent an initial work-force to the YAR in the late 1950s to design and construct a road from Sana'a to Hodeidah. The rocky and sharply undulating terrain over which the road had to pass constituted a major challenge. The work was completed, using labour-intensive techniques, in 1962, and is still rightly admired as a remarkable engineering achievement. The Chinese have continued to contribute to the highway programme, including the major link from Sana'a to Sa'ada and a road from Amran to Hajjah, which is now being extended to the coast road. As a result of their favourable record, the Chinese work-forces are now being invited to bid for a variety of projects in competition with other foreign and local contractors.

The Chinese work-forces appear to be highly motivated to complete projects on schedule and to acceptable quality standards. This is true in spite of the fact that they pay much lower wages to their nationals than the YR 70-80 per day demanded by Yemenis. However, it is clear that their bids do not realistically reflect their overall cost structure. Chinese work-forces normally receive two salaries, one in the country where they actually work, and a second salary which is received by their families in China. They do not pay taxes nor contribute to social security benefits. Furthermore, they have very little time off. The Chinese work-forces include no counterpart Yemeni nationals. This is unfortunate as the latter could gain much from the transfer of skills available within the Chinese work-forces, which are undoubtedly of a high calibre.

The largest and most active joint venture construction business is Saeed Kalpataru, which was set up jointly in 1977 by an Indian construction company and a Yemeni entrepreneur and has already completed a number of university buildings, offices, factories and residential buildings. It should be understood that the joint ventures operating currently in the YAR, although they serve a purpose, are not of the conventional kind where two or more companies join forces, each contributing technology, equipment and financing. The predominant technical and managerial contribution is made by the foreign partner, while the Yemeni partner has the necessary funds and credit to qualify as a bidder on public and private sector projects. Thus the actual transfer of technology and managerial skills is limited.

There are few local contractors with sufficient financial, managerial and technical resources to compete currently with foreign contractors on large or technologically complex projects. These resources can only be improved and augmented gradually; therefore the alternative strategies available are (1) to set up a national construction company to compete for large projects[1] or (2) to accept that there will be a continuing need to rely on

foreign companies (hopefully diminishing as local firms increase their capacity), at the same time taking measures to encourage these firms to offer reasonable prices and contribute to the general national development. Since the idea of forming a national construction company has not been accepted by the government, the following measures were recommended to encourage better service from foreign firms by:

1) Diminishing contractual risks so that bidders will reduce the "risk factor" in their profit margins and offer keener prices. Measures could include clearer drawings and contract documents, reducing the number of alterations due to changes in requirements, expediting decisions on queries and variations, allowing price adjustments based upon an agreed index of construction costs, facilitating the issuance of tax exemptions, visas and work permits and ensuring that contract payments against interim and final certificates are made promptly in accordance with the conditions of contract.

2) Requiring that foreign contractors contribute directly to the development process through counterpart and apprenticeship training schemes. Joint ventures might also receive direct encouragement, provided that they instituted formal procedures for the transfer of technical, managerial and commercial skills.

Local Contractors

The YAR is a country with a rich and unique building heritage, which is reflected in the technical skills of local building contractors who specialise in traditional technologies using stone, burnt clay bricks, mud bricks and gypsum. Before 1962 these traditional technologies predominated, and local contractors enjoyed a monopoly in a steady but limited market. At that time there were no foreign contractors working in the YAR apart from the Chinese work-force. During the succeeding eight years of civil war, public sector construction activity was almost halted, except for a limited amount of school and hospital building in the main cities of Sana'a, Ta'izz and Hodeidah. The traditional builders experienced a diminution of demand, ran down their limited stocks of tools and equipment, and allowed their labour forces to become dispersed. They were thus ill-prepared to compete for the many new development projects that became available in the drive to modernise the country in the early 1970s.

With the rapid expansion of construction works — both in size and quantity — few Yemeni contractors could cope with the complexities and new building techniques that were demanded. They found themselves unable to complete work to a fixed cost within a limited contract period. Many projects fell seriously behind schedule and were withdrawn from local firms and re-awarded to foreign contractors. With a great deal of development activity, little attention was given to the needs of local contractors, particularly in respect to upgrading their capacity and competitiveness, and many left the contracting industry to engage in more rewarding forms of commercial activity. Those local contractors who managed to stay active have often either employed foreign experts to work for them or deliberately limited themselves to small and simple projects, which they can manage successfully.

One problem in particular is that many of the so-called skilled workers in the construction industry in the YAR perform below internationally accepted levels of quality and productivity. Plumbers, carpenters, electricians and plasterers are generally inadequate due to poor training. There are hundreds of small Yemeni contractors working in their villages on houses or buildings such as schools. Most of the prototype schools in the rural areas were in fact built by these local contractors. However, at the present time there are few who can be relied upon to construct a major project on time and to acceptable standards.

There are some local companies that show considerable promise and would need only limited assistance to become, in due course, fully competitive with foreign contractors on all but the largest and most complex building projects. These firms are usually managed by an engineer or at least by a manager with substantial practical technical experience, and have a full range of equipment, experienced supervisors and skilled labour. Although there are a number of capable local building contractors, the picture in civil engineering, road construction and general public works is less happy. Even with outside assistance, a 5-10 year time scale would be realistic for the development of fully capable local firms in these more specialised and technically demanding areas.

Forty-one local contractors were interviewed in order to obtain a general picture of typical resources, capacities and problems. The annual work load of these contractors ranged from YR 2 million to YR 40 million, and the largest among them employed up to 1,000 people (mostly casual labour). The main difficulties perceived by these firms were as follows:

1) Bid documents prepared by the MPW and some aid agencies are not complete. Mechanical and electrical drawings and specifications are inadequate, and fully detailed bills of quantities are seldom available. In addition, the conditions of contract are frequently ambiguous and difficult to understand. Most bid documents are prepared in English, which creates a language problem. Also, time periods for studying the contract documents are often so short that the contractor is unable to prepare a fully detailed estimate.

2) Most of the materials used in construction are imported varying from 65 per cent to 80 per cent not including prefabricated construction), which creates additional difficulties for local firms in ordering and purchasing with adequate lead time. Handling and clearance in the ports is a further source of delay and dif-

ficulty. Custom duties for imported building materials are high, ranging from 30 per cent to 70 per cent. These bear particularly heavily on the local contractors, who are unable to demand remittance of tax on the contracts they undertake.

3) Transportation between the port of Hodeidah and other cities is very costly. For example, the hire of a 6-ton truck from Hodeidah to Sana'a costs almost YR 2,000. This can and does lead to enormous cost increases, stemming directly from transportation expenses. For example, these increases were estimated in 1976 to be 10 per cent for transport from Hodeidah to Sana'a and 120 per cent additional for goods transported from Hodeidah to Beida. New and better roads will, of course, eventually lead to somewhat lower costs at the final destination.

The operational cost of vehicles, plant and equipment is high due to the mountainous terrain, high wage rates for mechanics, drivers and operators, and delays in the delivery of spare parts .

5) Payments to contractors are often delayed for 2 to 4 months after they have been certified, due to prolonged processing procedures in government offices. Contractors' payment certificates are first checked by the supervising agency, but every certificate must also be examined and approved by the CPO and the Ministry of Finance before it can be honoured. These cumbersome procedures result in excessive calls upon a contractor's liquid reserves to fund work in progress and encourage contractors to restrict the commitment of resources to their sites, resulting eventually in delays to the construction schedule and additional overheads for the contractor.

6) Commercial banks rarely offer full lending and guarantee facilities to local contractors, and letters of guarantee, performance bonds and loans have to be fully covered by liquid reserves in a bank account or with full collateral backed by land or property.

7) One of the most crucial problems facing local contractors is a lack of effective management skills, particularly in the areas of estimating, costing, programming and general contract administration. Many of the contractors interviewed expressed a readiness to take advantage of technical assistance for construction management training if this were made available.

8) Skilled manpower is in short supply at all levels, ranging from engineers to technicians to supervisors, foremen and craftsmen. Site supervision is often ineffective, so that work is of barely acceptable quality and productivity levels are poor. Transporting skilled labour from Sana'a to construction sites in Sa'ada, Hajja or Beida, can add about 30 per cent to the cost of labour.

9) Since clients (especially government and aid agencies) are aware of the inexperience of Yemeni contractors and their low levels of supervisory skill and capital, they are understandably reluctant to award sizeable construction projects to them. This reluctance, coupled with the competition from foreign contractors, makes it very difficult for local firms to secure a stable work load and gain the experience they need to gradually improve their levels of performance.

There is an urgent need to improve the levels of efficiency and performance of local contractors, not only to moderate the escalation in housing and infra-structure costs but also in view of the substantial proportionate share of costs attributable to construction activities in investment and development programmes affecting other sectors of the economy. In order to upgrade the capacity and standards of performance of local contractors, attention must be paid to the following:

1) Provision of a reasonably continuous work load, so that it becomes worth while for the contractor to invest in physical resources and build up his technical and managerial skills.

2) Financial assistance, at least to the extent of ensuring that the client makes payments promptly on certified work in accordance with the terms and conditions of the contract.

3) Deliberate risk reduction by simplified or less rigorous contract conditions, or by making available materials or specialised plant and equipment to the contractor so that he can devote more attention to the physical planning and organisation of work on the site.

4) Direct advice and assistance through training, possibly supplemented by an on-the-job advisory service on an extension basis.

Consultants

Most of the design and supervision work on major projects is carried out by foreign consultants who are registered with the CPO and selected on the basis of technical evaluation (sometimes restricted in the case of bilaterally-funded projects). Fees are discussed, and if within range then negotiations for contract are entered into. Some of these firms have permanent offices or representation in the YAR, but others only establish a presence when working on a particular project. There are a few Yemeni engineers and architects in private practice, but they mostly concentrate on simple building projects for private clients. There is a definite need for an improved local source of technical consultancy expertise to assist the government in planning and decision-making, and to regulate the activities of foreign consultants and ensure that their design and supervision procedures are fully appropriate to general strategies for national development as well as to provide efficient solutions on individual projects.

The government is aware that, in spite of the rise in the number of Yemeni graduate engineers and architects, the need for the services of foreign consultant

firms and individuals will inevitably persist for some years to come. This, however, is no reason for neglecting to provide opportunities for local engineers to gain experience from such consultants so that they will be able, in turn, to make their own increasing contribution to the achievement of the nation's development objectives. The government should require its consultants to make a more conscious effort to provide positive work experience and training for local engineers and architects, so that the status and contribution of the profession becomes steadily more relevant to local needs.

Evolution of Construction Costs

Construction costs have risen steeply in recent years. The MPW has made initial calculations for the establishment of a "Building Cost Index", with weights assigned to major cost factors based on an analysis of a wide range of public sector building projects, specifications and costs over a five-year period. The first annual calculation shows an escalation in costs of over 30 per cent between April 1979 and April 1980 (Table 1). According to various agencies including the MPW, the increase was about 23-25 per cent between April 1980 and April 1981.

Table 1 **MPW Building Cost Index** (Base = April 1979)

No.	Item	Weight	Cost April '79	Cost April '80	Per cent increase (decrease)	Weighted percentage
(1)	(2)	(3)	(4)	(5)	(6) $\frac{(5)-(4)\times 100}{(4)}$	(7) (6)×(3)
1	Stone	0.12	650	1,300	100.00	12.00
2	Bricks/blocks	0.03	300	340	13.33	00.40
3	Aggregate	0.05	260	300	15.38	00.77
4	Sand	0.06	250	280	12.00	00.72
5	Cement	0.13	640	798	24.69	03.21
6	M. Steel Rods	0.07	3,500	2,940	(16.00)	(01.12)
7	Timber	0.11	1,425	2,131	49.54	05.45
8	Tiles	0.01	180	240	33.33	00.33
9	Skilled Labour	0.28	200	240	20.00	05.60
10	Unskilled Labour	0.09	60	80	33.33	03.00
		0.95				30.36

Architectural Style

The rich style of architecture in the YAR is currently in transition, reflecting the introduction of new materials to supplement and modify traditional materials and methods. Hand-dressed stone is still the most common material on the plateau, but mechanical methods of quarrying and cutting are gradually being introduced because of the current high cost of labour. Traditionally, bricks are still made by hand, but mechanised brick factories using the latest automatic firing and handling equipment are beginning to offer competitive products. Reinforced concrete is now widely used as a structural frame, but it is often in stone to simulate the traditional style. Structural steel is hardly ever used, apart from certain workshops and commercial buildings.

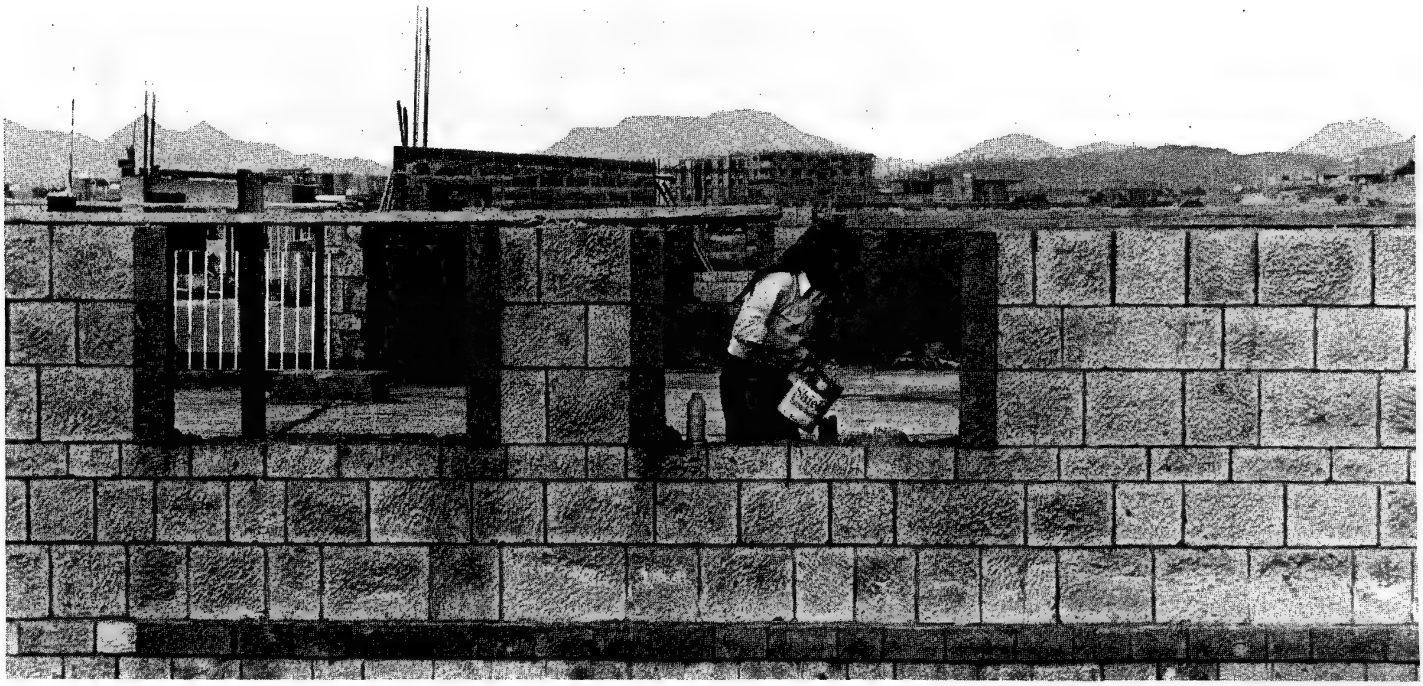
Hajjah. Stone details in the interior courtyard of the old Imam's Palace.

Photo: C. Little/Aga Khan Awards.

In parts of Sana'a, Hodeidah and Ta'izz, the expanded use of concrete blocks, which are relatively cheap to produce, has resulted in a departure from the traditional Yemeni architectural style. Such departures should be discouraged. Before issuing building permits, the municipal authorities should ascertain minimum adherence to traditional architectural forms.

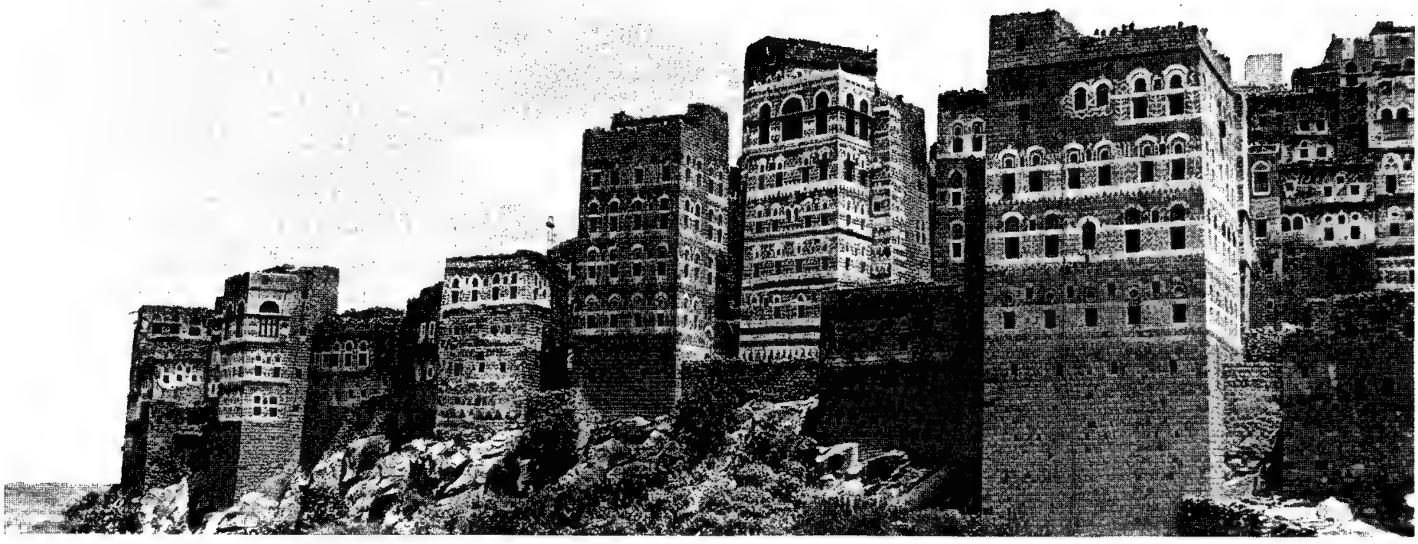
Some of the features of architectural design in the YAR are as follows:

Mass: Massive stone walls, usually about 50 cm thick, have the merit of heat insulation and storage. In the mountainous areas, the temperature drops sharply during the night, and the heat stored in the walls during the day is gradually radiated into the rooms. Thus massive wall construction offers an advantage over modern skeletal construction,



Sana'a region. Contemporary masonry construction often follows traditional techniques.

Photo: C. Little/Aga Khan Awards.



Al-Hajara.

Photo: C. Little/Aga Khan Awards.

namely a comfortable indoor climate during both day and night without any need for artificial heating or cooling. Even when reinforced concrete frame structures are employed, it is preferable to employ massive stone cladding to provide thermal insulation. The high initial cost of natural stone is often out-weighed by a long-term saving of fuel and a comfortable living environment. Structural masonry walls are also highly durable and make effective use of local materials. The potential limit for structural masonry is about six storeys since higher structures require very thick walls at ground floor level. The top three storeys are often built of brick because it is light, relatively cheap, and does not detract from the general appearance.

Surface: The external surface of traditional buildings is flat, reflecting the structural nature of the wall and the lack of materials strong enough in tension to form cantilevers. Elevations often vary from floor to floor, because stone is used to give strength to walls in the lower storeys with several storeys of brick above. Windows are often large on the upper floors and may be surrounded with intricate plaster decorations. In contradistinction to the prevailing trend in western architecture, purely decorative features are still very popular among both architects and clients in the YAR. Therefore, individual buildings vary and present more subtle and less rigidly geometrical outlines than are common in contemporary architecture elsewhere.

Volume: The overall form of the building enclosed by the external surfaces is seldom of the rectilinear "box type". The shapes of the sometimes large traditional buildings are usually broken down into more complex masses by juxtaposition of at least two separate rectilinear forms. Unless this technique is followed in designing modern buildings, the latter tend to dwarf the surrounding traditional structures. Another feature is the strong vertical emphasis in the massing of traditional buildings.

Symmetry: The most obvious feature of both traditional and modern Yemeni architecture is the use of arched openings rather than rectangular ones, leading to greater symmetry. These arched openings usually contain the characteristic carved gypsum "quamaria". The centre line of an arch is more clearly apparent than that of a rectangle, and this is frequently emphasised by bringing the surrounding decoration to a point at the apex. The symmetry may be extended to a series of openings by flanking a central one with a pair of similar openings.

General Townscape: A feature of the typical Yemeni townscape is the strong vertical emphasis, resulting from the preference for expansion of dwelling units by adding storeys rather than extending construction at ground level. As in most Arab countries, owners prefer to protect and define their plots with high solid screen walls. The older parts of Sana'a and other cities present a unique and highly attractive appearance, with richly ornamented stone and brick buildings usually 6 to 8 storeys, with some as high as 10 storeys. In addition to height, another characteristic of Yemeni construction is the rectangular plan shape of the buildings and their clear-cut cubic form. This is caused by the lack of central internal courtyard, and by the custom of extending buildings upwards. Thus, flat roofs are characteristic and dome roofs are usually seen only on mosques.

The preservation of the traditional building, even when using new technology, is of prime importance. In keeping with tradition, vertical lines and large, massive rectangular architecture appear appropriate even today. Similarly the facings constructed of natural stone and burnt brick are still suitable. Window character (arched openings) can be retained in the design of new buildings. Traditional motifs and ornaments can also give architectural character to modern public buildings, although direct copies are neither necessary nor desirable. Large new buildings need not be obtrusive; the Central Bank building is good example of a new structure which provides an acceptable addition to the townscape of Sana'a.

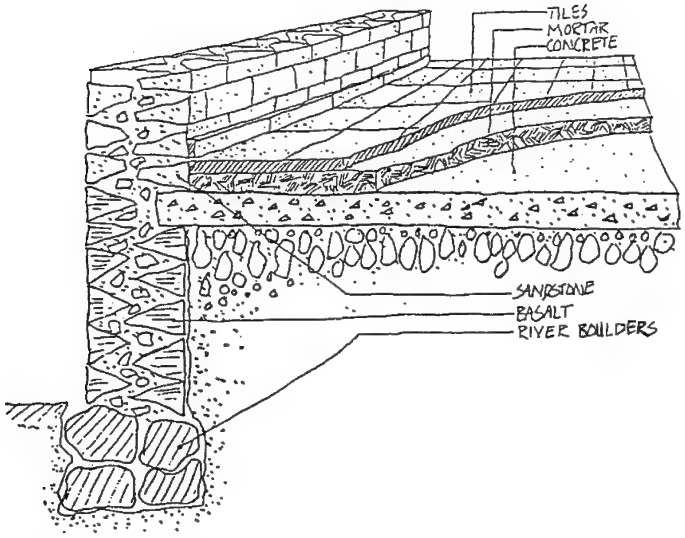
Building Design

The traditional and contemporary designs that are generally current in the YAR have the following main features:

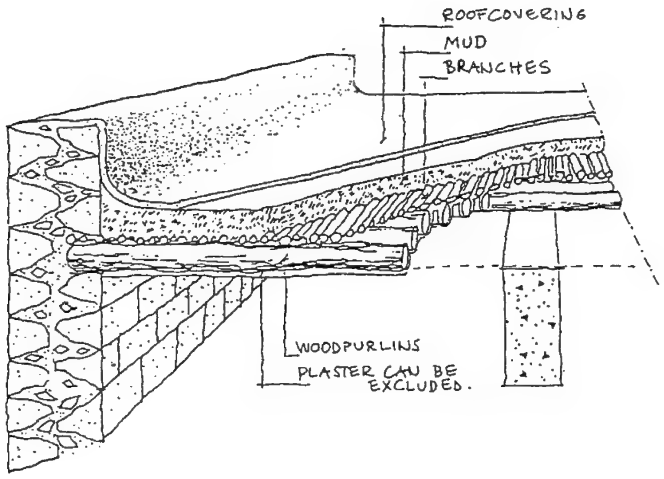
Foundations: As the load-bearing capacity of local soil is, in general, good, the traditional foundation system based on basalt or river boulder footings and concrete floor slabs is considered to be appropriate and economical. However, foundations appear sometimes to be unnecessarily deep, and might be reduced if soil investigations were undertaken to determine bearing capacity. The sketch on the next page shows a typical section of foundation, wall and ground floor.

Structural Systems: Traditionally, load-bearing walls are of natural stone or brick and attest to the high (but at present expensive) skills of Yemeni stone cutters and masons. These walls permit intermediate floors and roofs to span about 3 m. Floors are usually of timber beams with traverse branches covered with mud and/or tiles. Newer buildings have reinforced concrete slab floors. Contemporary buildings in the Hodeidah area are commonly of reinforced concrete frame construction with hollow concrete block walls. Reinforced concrete is, however, of less reliable quality than stone. Cement and reinforced steel are mostly imported, and the execution is often of poor quality for such reasons as lack of training, poor shuttering timber, inferior aggregates, polluted water, inadequate compaction and poorly maintained concrete mixers. Except on large projects, concrete quality is rarely inspected by a qualified technician or engineer, and facilities for concrete testing are not available.

Wall Finishes: Walls of natural stone or fair-faced brickwork do not need external finish and do not require maintenance.



Typical section of foundation, wall and ground floor.



Traditional flat roof construction.

Walls of hollow block, on the other hand, are generally plastered and require regular maintenance. The internal face of stone walls is quite rough as the stones are generally uncut; it is normally finished with a thin layer of gypsum plaster which covers the irregularities. This surface requires maintenance and repair, and a more resistant finish would be desirable.

Floors: Floors generally are covered with cement floor tiles. The tiles currently used are of rather poor quality and bad workmanship but could be improved with better production methods. They often give the appearance of being dirty even when new.

Roofs: Almost all buildings in the YAR have flat roofs. The traditional roof covering material is lime plaster, but modern buildings may use such materials as asphalt and terrazo tiles. Both new and traditional roofs have a tendency to leak, due to the lack of a waterproof membrane, insufficient slopes, bad workmanship and bad maintenance. Despite their need for regular maintenance, the traditional heavy roofs provide good thermal conditions. They reflect 60 to 80 per cent of solar radiation if plastered with lime. In principle, the ideal roof for YAR would be a heavy, sloping, waterproof construction employing local materials, which suggests that dome and vault construction could be an alternative form. However, the dome and vault is contrary to tradition, which sees the flat roof used as a working area, and it does not allow for vertical expansion.

Modern Design: Some modern techniques such as pre-cast concrete panels, prefabricated elements and concrete tunnel form system, have already been introduced in the YAR. There is potential for additional use of modern systems of construction, particularly in projects where time is of the essence. The following five systems could have merit in certain specialised applications: cast *in situ* concrete, prefabricated systems using light elements, prefabricated panel systems, lightweight concrete systems (such as tong), and tunnel form systems. A brief evaluation of the five approaches is given in Table 2. A specific evaluation based upon comparative cost estimates would have to be made in the case of any particular proposed project.

Climatic Design: One aspect of design which has been accorded insufficient attention in the YAR is that of the need to adapt designs, technologies and locations to suit local climatic conditions. With assistance from UNDP Project YEM/73/006, MPW has issued a document "Climatic Design in Yemen", which contains design recommendations for the four main climatic regions: the Tihama, Midlands, Highlands and Eastern Desert. The document also includes the Mahoney tables for the main cities and diagrams displaying the variations of the solar azimuth and altitude and charts with vertical angle tables according to the time of year and the latitude. If these guidelines are understood and followed by local architects, buildings will provide an increased degree of comfort for the occupants without the need for artificial heating or cooling. Any future building code should take full account of these practical recommendations for proper climatic design.

Table 2 **Comparative Merits of Modern Designs**

System	Investment Cost	Production Time	Level of Technology
Cast *in situ* concrete.	Comparatively low; mixing plant, mobile cranes, mixer trucks, (ca. US$1 million).	Prompt start up, but rate of production limited by plant capacity.	Well-understood, but requires skilled labour.
Prefabricated, using light elements.	Mixing plant, casting yard, mobile cranes, trucks. (ca. US$3 million).	Prompt start up and rapid production.	Relatively simple, but capital-intensive.
Prefabricated panels.	Specialised factory, lifting and transport equipment. (ca. US$6 million).	Start up 1 to 2 years after commencing factory construction.	Capital-intensive, both in production and erection.
Lightweight concrete (blocks and panels).	Ca. US$20 million for factory producing 300 m^3 per day.	Start up about 2 years after commencing factory construction.	Capital-intensive, both in production and erection.
Tunnel form.	Comparatively low. Forms plus equipment for cast *in situ* construction.	Very rapid if site management is competent.	Capital-intensive.

Construction Technologies

In the urban areas construction is often carried out using modern techniques. The relatively high wages and reduced productivity in recent years have led contractors to make investments in labour-saving plant and machinery.

Quarries: The large quarries that produce 300 or more cubic metres of aggregate per day are equipped with modern plant such as track-mounted pneumatic drills, Caterpillar D-8 bulldozers and 977 loaders. This equipment is normally operated by Yemeni labour, although maintenance and repairs are sometimes the responsibility of expatriates. In the small quarries producing 50 cubic metres per day or less, the technology level depends upon the equipment available, but is generally more labour-intensive.

Excavation, Earth Movement and Trenching: The major construction companies in the YAR are well supplied with the best available heavy equipment. Most of this is less than five years old and dates from the period 1974-75 when foreign contractors started to compete seriously for major projects. Some of the larger local contractors are prepared to hire out surplus plant when it is not needed on their own jobs. In the rural areas there is still considerable hand labour used for grading and drainage projects in the villages. When these projects are too extensive for the villagers to implement on a self-help basis, the LDA is often able to obtain heavy equipment. In the public sector, the Highway Authority (which itself operates the Komatsu agency) is well-equipped for road construction, and is also able to supply equipment for local development projects. There is no substantial local assembly or parts manufacturing industry, and it is unlikely that there will be a sufficient market for this in the foreseeable future.

Reinforced Concrete: The major construction companies engaged in projects requiring a large volume of concrete generally erect on-site automatic batching plants and bulk cement silos. Concrete is transferred to the work place by mixer truck, dumper or concrete pump. Most of these plants can produce 50 cubic metres or more of concrete per hour. The cement is delivered in 20-ton bulk transporters, thereby reducing the unit cost of cement by at least 10 per cent compared to the bagged product. These plants usually produce quality concrete of the bearing strength specified, and testing facilities are available on large project.

There are also independent transit mix concrete companies in Sana'a and Hodeidah. These companies have large batching concrete plants and 5 to 7 m^3 mixer trucks for delivery to the client's site. In Sana'a this is a relatively new enterprise and has so far achieved only limited acceptability among the medium and small size contractors. The Sana'a Ready Mix Concrete Company is capable of mixing and delivering 500 m^3 of concrete per eight hour day, but to date has developed a market of only about 200 m^3 per day. In areas such as Sana'a where labour is in short supply and wages high, the attractions of ready-mix concrete are likely to lead to an increasing market penetration.

On smaller sites concrete is still mixed in ¼ m^3 drum mixers with batching by volume. Quality concrete of specified strength can be produced by this method provided that the operation is properly supervised. In some of the more remote areas, concrete is still mixed by hand. The development of the methods and procedures for the placing and compaction of concrete has progressed in step with the progress achieved in concrete production. The large companies engaged in the construction of high-rise buildings employ tower cranes with skips for lifting and placing concrete or, if working on high-volume low-rise structures, hydraulic mobile cranes. The medium-size contractors generally confine their projects to three to four-storey structures and hire mobile cranes for placing concrete and lifting heavy loads. The small contractors are usually involved in residential or one to two-storey commercial buildings and often have electric hoists for placing concrete and raising materials. In the rural areas where structures are seldom more than one storey the concrete is usually placed by hand. Both large and small contractors generally have mechanical vibrators for compacting the placed concrete, and the quality of work is broadly acceptable.

All reinforcing steel is currently imported, although plans for a small rolling mill are under consideration in the YAR. Most of the structures designed by local engineers use the readily available mild steel. Many of the foreign engineered projects are designed for high tensile steel, which is justified provided that quality control procedures are adequate. As an illustration of potential savings, approximately 40 per cent less high tensile steel is required to obtain the same structural capacity as concrete reinforced with mild steel, and reduced labour and shipping costs can also be offset against the higher unit cost. Most contractors set up a reinforcement fabrication yard on the site, as there are no specialist steel stock-holders who will cut, bend, fabricate and deliver reinforcement cages. The bigger projects have electric or hydraulic cutters and benders which are essential for fabrication of tensile steel. On the smaller jobs using mild steel, cutting and bending is generally done manually using hand tools and simple equipment.

Masonry and Plastering: Due to the shortage of skilled masons and generally low productivity, most major projects have eliminated stone as a load-bearing material, although it remains popular as a facing to reinforced concrete frame structures. On a few of the new projects there is a limited amount of brick used for architectural effect. The exterior walls of high-income housing are usually constructed in stone masonry, and this work is executed with great skill by local masons. The architectural appearance of houses is most appealing, but the cost of labour and material is high and only well-to-do clients can afford mass stone masonry. Thus projects which would appreciably reduce the cost of stone cutting and preparation would be generally welcomed. On major projects plastering is occasionally sub-contracted to local firms. Some of the local plasterers are highly skilled, but their levels of productivity are generally low and there would be advantages in vocational training and apprenticeship programmes aimed at improving both the skill and the tempo of this work.

Installations: All complex mechanical and electrical equipment is imported. The advanced technology of installing and commissioning this equipment requires the services of qualified engineers and highly skilled technicians. Such skills cannot now be found in the YAR, and expatriate technicians must be employed. Even after commissioning, expatriate advice is often required to set up operational and maintenance schedules. In medium and small jobs, the installations are less complex, and many components can be procured from local merchants,

Sana'a region. Concrete construction being used for low-rise housing.

Photo: C. Little/Aga Khan Awards.

although only PVC conduit is currently manufactured in the YAR. A general contractor normally employs a specialised sub-contractor for the installation, and the latter is usually able to work with local designs and materials. Nevertheless, local contractors will require specialised training and on-the-job experience before they can compete effectively with foreign specialist firms on more advanced projects.

Material Standards: Until recently facilities for materials testing and research were limited to temporary site laboratories set up by consultants and/or contractors on large projects.

Over 60 per cent of total investment was to be spent on projects related to infrastructure and other service sectors, reflecting the inadequacy of the YAR's physical infra-structure and the government's desire to strengthen it. The largest share was allotted to transport and communications, mainly roads, representing 31 per cent of all investments, and 41 per cent of the total investment (YR 5.4 billion) was to be carried out by the central government. Further shares of rather less than a third was to be carried out by public and mixed enterprises (YR 4.9 billion) and the private sector (YR 4.5 billion), with the remaining YR 1.1 billion by co-operatives (including LDAs).

Although precise figures are not available, it is clear that construction demand was well in excess of that expected in the first year or so of the Plan, but there are indications that it has tapered off subsequently. The annual growth rates of GDP related to the construction sector in 1976/77, 1977/78 and 1978/79 were 61 per cent, 20 per cent and 10 per cent respectively, compared to a Plan target of 14 per cent per annum. GFCF at constant 1975/76 prices is estimated to have grown by about 87 per cent in 1976/77 and a further 14 per cent in 1977/78. The overall investment was in fact undertaken by the private sector in the first two years of the Plan, with residential buildings accounting for over 40 per cent of GFCF.

Table 3 **First Five-Year Plan, 1976-1981**

	Expected Share of Construction in Gross Fixed Capital Formation (YR millions at 1975/1976 prices)						
Sector	Civil Engineering Works		Buildings		Total Construction		Sector GFCF
Agriculture	1,255	55%	57	03%	1,312	58%	2,276
Industry	413	12%	815	23%	1,228	35%	3,545
Construction			15	03%	15	03%	451
Commerce			379	60%	379	60%	628
Transport and Communications	4,440	89%	10	01%	4,450	90%	4,925
Finance			15	16%	15	16%	93
Housing			2,085	100%	2,085	100%	2,090
Services	50	03%	1,247	64%	1,297	67%	1,963
	6,158	38.6%	4,623	28.9%	10,781	67.5%	15,791

Source: YAR, Central Planning Organisation, Five-Year Plan 1976-81, *(Sana'a, 1977), p. 215.*
Note: It should be kept in mind that the percentages may be unduly high as they may include items not usually considered as normal construction materials. This applies in particular in the case of the categories "Transport and Communications" and "Services".

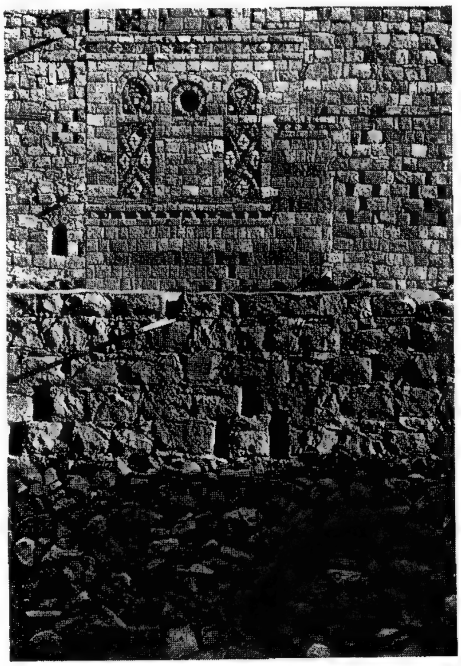
Table 4 **Gross Fixed Capital Formation** (YR millions, 1975/1976 prices)

				Annual Average Increase (%)	
	1975/76	1976/77	1977/78	Actual 76/77-77/78	Plan Target 76/77-80/81
Private Sector	519	1,142	1,208	53	30
Public Sector	254	305	444	32	70
Total GFCG	773	1,447	1,652	46	48
Housing	286	590	716	58	32
Transport	232	471	492	46	50
Industry	61	209	189	75	86
Agriculture	106	76	157	22	52
Other	88	101	98	06	—

Source: World Bank, Yemen Arab Republic — Economic Memorandum, *Report Number 2856-YAR, (Washington, D.C., 23 October 1980).*

It was inevitable that such an ambitious Plan would be difficult to implement effectively, and some of the specific problems were:

- Lack of qualified local labour;
- Weakness in the government administrative framework;
- Inexperience within government agencies;
- Lack of co-ordination between government agencies;
- Lack of co-ordination between government and bilateral aid agencies;
- Pronounced increase in the cost of building materials, labour and land, which were reflected in enhanced general implementation costs;
- Lack of experienced Yemeni contractors able to execute the projects;
- Difficulties in acquiring sites for the various projects; and
- Lack of funds for financing development projects.



Traditional stone construction in a highland town.

Photo: C. Little/Aga Khan Awards.

Building Materials

Traditional and Modern Materials

The heavy reliance on imports is a continuing problem as materials comprise 60 to 70 per cent of construction costs in the modern sector. There are many proposals for increasing local production of basic materials, which if successfully implemented would provide for an increasing proportion of domestic requirements and, in some cases, a surplus for export. The government is urging the private sector to be a major investor in the expansion programmes. Most of the existing production plants are financed from local private sources, sometimes with foreign participation. The only major building materials industry in which the government is involved is cement.

There are two distinct "building regions" having traditional building materials and methods. These are the interior mountain region and the Tihama plain along the Red Sea. Improvement in communications is, however, gradually reducing the differences. Cement blocks and reinforced concrete are becoming more wide-spread everywhere.

The traditional materials for the mountain area are natural stone, burnt clay bricks, mud bricks, timber and branches, and gypsum. Natural stone is used for foundations and exterior walls, and this is particularly important because of its excellent thermal insulation qualities in an area of temperature extremes between night and day. Burnt bricks are used for exterior walls. Mud bricks are used for interior walls and for internal lining of exterior walls. Timber is used for roofing, doors and window frames, while branches are used as filler material between timbers. Gypsum is used as plaster for walls, ceilings, and floors, as well as for decorative arches over windows and doors.

The traditional materials for the coastal region are burnt clay bricks and mud bricks, while natural stone, which is so commonly seen in other parts of the country, is generally missing.

Materials that have been introduced in recent times are hollow cement blocks for walls, reinforced concrete slabs to replace traditional roofing and flooring materials, reinforcing rods and structural steel, and terazzo and cement floor tiles. Steel and the better quality tiles are imported. Wood, once obtained from Yemen's now depleted forests, is mostly imported. The manufacture of doors and windows is done locally in small workshops. Notable examples of the usage of modern materials in the Sana'a area are: pre-cast concrete tunnels, pre-cast concrete panels, imported steel structures and prefabricated panels.

Quarrying and Stone Cutting

Quarries are dispersed throughout the country, and most are small or medium sized enterprises. The stones are usually roughed out at the quarries, finishing normally being done by hand at or near the building site. But the recent escalation in the cost of labour is reducing the use of stone and causing the introduction of substitute materials. The introduction of electric saws to cut the stone and thus reduce the labour factor has not met with unqualified success, because the resulting flat and even surface is far less attractive than a rough hewn surface.

It is generally believed that stone accounts for half of the total demand for external wall materials, especially in the highlands.

The varieties of stone in common use are:

- Basalt: a hard black stone used in foundation walls and footings;
- Volcanic Stone: black or grey lava, popular for decorative use in facades around windows, arches and corners;
- Sandstone and Tuffite: available in the highlands in a wide range of colours

Table 5 **Demand for Building Stone, 1980**

	Built-Up Area (square metres)	Total Requirements for External Wall Materials[1] (metric tonnes)	Estimated Market Share of Stone for External Walls (metric tonnes)[1]
Sana'a	500,000	350,000	120,000 (35%)
Hodeidah	290,000	200,000	20,000 (10%)
Total	790,000	550,000	140,000

[1] Expressed in terms of standard stone (400 mm × 200 mm); it is estimated that one cubic metre equals 60 stones and weighs 2.5 tonnes.

Source: YAR, Central Planning Organisation, Appraisal of Industrial Opportunities in the Industrial Sector, *(Sana'a, May 1977).*

(yellow, red, green, grey), and used for load-bearing walls;
- Limestone: a hard, heavy stone used mainly for foundations and infrequently for walls.

The usual shape of a cut stone block is cubical and with sides roughly 20-25 cm long. The type and precision of cut varies widely from region to region according to the wealth of the inhabitants and the nature of the stone available. To reduce costs, it is common to limit the more precise and time consuming work to the main facade.

Stone floor tiles are produced in small workshops but are of variable and generally unsatisfactory quality. These products are traditional in the YAR and are produced in sizes varying from 40 cm square to 60 cm square. They are generally rough cut and uneven, with a thickness up to 25-30 cm at the centre. A simple mechanisation of these production facilities could produce a more uniform and acceptable product which could be thinner and therefore less expensive to handle and distribute.

The Central Laboratory of the Ministry of Public Works has undertaken limited research on the relative suitability of local stones and has, in particular, identified certain types that lose a significant degree of strength when wet.

A major central mechanised project for the production of simulated hand-cut stone facing slabs is currently being investigated by the National Company for Industrial and Construction Materials (YEMROC), a state-owned enterprise, with the assistance of the World Bank/UNIDO Co-operative Programme (CP) for possible financing by international lending institutions. The project was identified by a CP mission that visited the YAR in 1979 to investigate possibilities for the local production of building materials. The project envisaged provides for a production capacity of 70 cubic metres of stone strips and blocks per day at an investment cost of about US$17 million. The project would include some capacity to produce polished slabs for facings where limestone is the material used. The technical attributes of the project were developed by the Austrian University of Mining and Metallurgy under contract to the World Bank/UNIDO Co-operative Programme in Vienna.[2]

The main argument for this project is that it aims to produce an attractive, acceptable stone at reduced cost through the large-scale introduction of labour-saving techniques and equipment. While it is true that natural stone is in danger of being superseded by other materials as a result of disproportionate price inflation in recent years, the cost and market acceptability of the product that will result from this application of new production techniques still needs investigation. The possible site in the Sana'a area will also require an hydrogeological survey to ensure that a sufficient water source is available. A more general point affecting the attractiveness of a capital-intensive process is the possible surplus of unskilled labour in the mid-1980s, and this factor should be carefully investigated during the project appraisal.

Whether or not the proposed central mechanised project is implemented, the existing industry will continue to have an important role as a dispersed provider of materials and as a generator of relatively well-paid employment opportunities to a skilled, but highly specialised, group of individuals. It is therefore recommended that steps be taken to encourage limited mechanisation of stone cutting among small and medium sized enterprises at the same time that the major project mentioned above is undergoing evaluation. The heavy demand for stone that is acceptable in appearance and reasonable in cost would support both ideas. Both stone cutting and finishing could be undertaken at smaller quarries using a compressor and pneumatic tools, thereby reducing unnecessary transportation and increasing rural employment opportunities. The soft tuffite could be finished with simple electrically-powered hand tools.

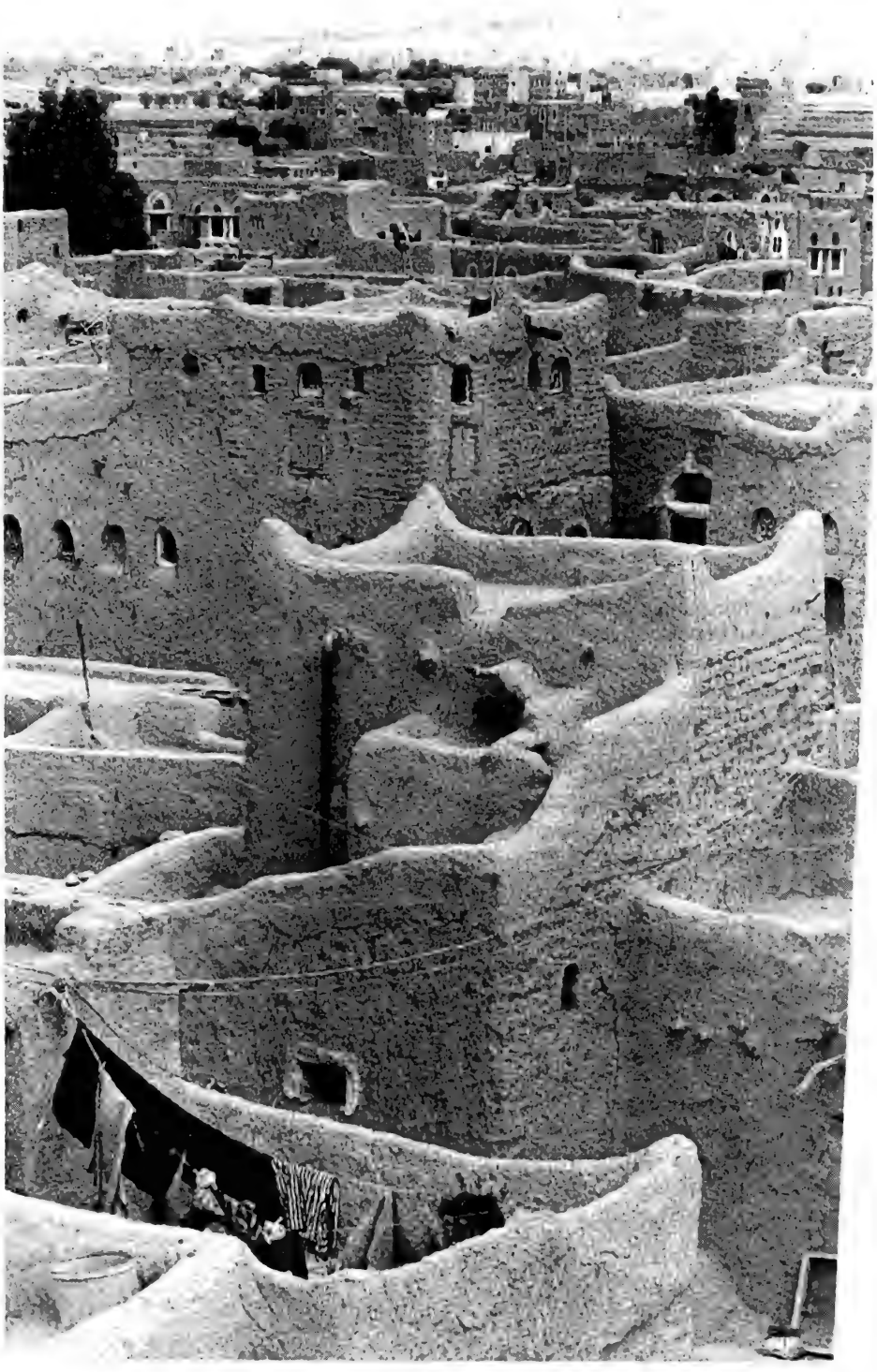
Marble

There are a number of known marble deposits in the YAR, and reserves are estimated to be relatively significant. However, domestic marble is not exploited, and the little that is used in special construction is imported, mainly from Italy. Speculation has existed for a very long time that Yemen's marble deposits could be profitably utilised for slab and terrazzo tile production, not only for the limited local market but also

for export to Saudi Arabia, the Gulf states, and other regional markets.

The best known marble deposits seem to be the one at Wadi Maksab at the gateway to the mountains between the port of Mokha and Ta'izz. At the request of YEMROC, this deposit was investigated in April 1979 by the geologists employed by the CP. Here the marble strata form the slopes of a deep, steep-sided valley and are about 250 m thick. The predominantly light grey marble is shot through with basalt dikes and there are numerous faults. The extent to which the faults are superficial or run deep could not be determined by the team, and subsequent to the expedition, it was recommended to YEMROC that substantial digging be done to determine the sub-surface condition of the marble and thus the possibility of obtaining large slabs.

The Co-operative Programme's 1979 field mission also visited a marble outcrop at Shibam, some 30 km southeast of Ta'izz. The deposit there is 80 m thick over a length of about one kilometre, white in colour, and appears to be of better quality than that of Wadi Maksab. Reserves were estimated at 40 million tonnes by Russian geologists in 1964. A project for the production of terrazzo tiles from a quarry at Shibam was elaborated by the CP after the 1979 investigation. This project provides for the production of 350 square metres of terrazzo tiles per day at a total investment of YR 16.3 million (US$3 million).[3] Presumably the question of land ownership, which is a delicate and complex question in the YAR, has prevented YEMROC from taking serious interest in this project, although it would appear to merit consideration.



In Amran, earth is used as a construction material.

Photo: C. Little/Aga Khan Awards.

Mud as a Construction Material

Mud is perhaps the oldest material ever used by mankind for construction purposes. It was used by the ancient Egyptians and Assyrians in housing construction, and where it is still available its

use continues. It is probably the least expensive building material known and has excellent thermal qualities. However, the use of mud as a construction material has decreased simply because it is outmoded and because the techniques for using it have been forgotten. People are no longer knowledgeable about its good qualities and are even prejudiced against its use.

Used in its natural form, mud requires extensive maintenance. Every year, it is necessary to add a layer of mud plaster to the exterior surface where it is exposed to rain. Much research has been done on development of this material to make it more resistant to rain, for example by adding cement or asphalt. When combined with a more durable material, or used with burnt bricks or stone as an exterior facade or as a filler for hollow cement blocks, it can be considered a suitable material for low-cost housing.

The introduction of modern building techniques should not be reason to reject traditional materials such as mud bricks, which in many instances are found to be cheaper and more suitable for the environment. What is needed is more research into developing mud products in order to make them more durable.

Mud mixed with either cement or asphalt is more durable than mud in its simple state and requires far less maintenance. It is now used as interior wall lining in many residential buildings in the YAR. Usually, it is plastered with gypsum. Mud has been used as a filter for hollow concrete blocks in school construction in the Tihama area because of its thermal qualities. It is not widely used in the Sana'a area because of the wide-spread usage of stone in that area. However, there is no reason why mud used in combination with hollow concrete blocks would not be suitable for the Sana'a area as well.

Table 6 **Brick Manufacturers in the YAR**

Company	Annual Production of Clay Products (metric tonnes)	or	Standard Bricks (millions)
The Yemen Brick Manufacturing Co, Sana'a	25,000		8
The National Company for Red Brick and By-Products, Al-Mansuriya	32,000		10
The Red Brick Factory, Hays	32,000		10
The Al-Ansy Factory (proposed), Mabar	48,000		15

Fired Clay Building Materials

Burnt Clay Bricks and Hollow Blocks: At present, there are three mechanised brick plants in production and another under construction. The four plants are located in Sana'a, Al-Mansuriya, Hays and Mabar. In addition to these mechanised plants, there are a substantial number of small-scale scattered artisanal producers (the annual production in the Sana'a area alone is estimated at 5 million bricks). The quality of the bricks manufactured by these small-scale plants is highly variable, but could be improved if practical advice and assistance were made available.

The Yemen Brick Manufacturing Company in Sana'a has Czechoslovakian equipment, which appears to be generally adequate, although it is likely to require considerable maintenance. The curing sheds and kilns are well engineered, but the bricks are very soft and develop multiple surface cracks. These bricks cannot be used in load-bearing walls. The problem appears to stem from the poor quality of the raw material, and it will be necessary to investigate whether a different mix (possibly more sand) could result in a more satisfactory product or whether material should be won from a more suitable source. A contributory factor could be unsatisfactory air drying due to the very dry climate in Sana'a.

The National Company for Red Brick and By-products, Al-Mansuriya, has equipment of excellent quality imported from the Federal Republic of Germany. The curing sheds are fully enclosed with automatic fans which extract surplus heat from the kilns. The kilns are of advanced design including overhead firing. Loading and unloading of the kilns are completely mechanised. When this plant first went into production, the bricks were of excellent quality and sufficiently strong to be used in load-bearing walls. However, due to inadequate materials research and testing at the feasibility study stage, the raw materials had to be brought in from a distance of more than 40 km. The plant later switched to a clay deposit closer to the site, but this material has not proved satisfactory in as much as bricks frequently develop surface cracks after firing and the plant is planning to go back to the original source for the clay material. When in full production, it should be able to supply the requirements for a complete line of clay products to serve Hodeidah and the surrounding area.

The Red Brick Factory, Hays, has good quality Italian-manufactured equipment. The curing sheds are fully enclosed with automatic fan dryers. The kilns are overhead-fired and of very large capacity. The movement of the air-dried products to the kilns is only semi-automated, and the pellets that are placed in the kilns have to be hand-loaded and moved by mechanical trucks, a procedure that slows down overall production. The pulverising and mixing machinery is suitable for a great variety of products, and the production of clay pipe should be feasible. Currently, the plant is producing bricks and

hollow clay blocks.

The capacity of the proposed Al-Ansy plant at Mabar is 50 per cent greater than the Al-Mansuriya and Hays factories.

The products manufactured at the two factories in the Tihama plain are likely to have an appreciable crushing strength and therefore potential as load-bearing walling products. They could also be used as facings without exterior plastering. This would necessitate additional attention to quality control, testing and sorting to ensure that the products meet an acceptable standard. If this could be achieved, it is likely that an improved market penetration could be secured since the additional labour cost involved in laying bricks would be counterbalanced by the saving in plastering cost on concrete block walls and/or the cost of erecting a reinforced concrete frame. The problem is partly one of marketing, but also one of setting standards for load-bearing clay brick and block walls so that architects and engineers can be persuaded to incorporate such products in their designs. Insulation could be improved by incorporating urethane in the cavity between the facing brick outer skin and the concrete block inner skin.

Clay Pipes and Roofing Tiles: Vitrified clay pipes could be a useful product for sewerage purposes in parts of the Tihama plain where concrete pipes are subject to deterioration from salt attack. However, vitrified pipes are comparatively fragile and therefore subject to breakage if transported over difficult roads or mishandled during the laying process. A centralised large-scale production plant is not therefore recommended. On the other hand, vitrified clay pipe could provide a useful diversification for the clay brick and block factories at Mansuriya and Hays. Pipes could be manufactured up to 15 cm in diameter for use in houses sewer connections and as agricultural drains. Where the costs of transport are significant, clay pipe is unlikely to be competitive with the PVC pipes produced at the factory at Ta'izz. Clay pipes could also be usefully promoted as a village-scale industry for strictly local use. Pitched roofs have not so far been incorporated in buildings in the YAR, and it is therefore doubtful that there would be a market for conventional clay roofing tiles. A further factor is that timber for trusses, purlins, etc. would have to be imported. However, it would be possible to improve the water-proofing of flat reinforced concrete roofs by laying flat tiles on top of a waterproof membrane. These tiles could later be removed if the owner wished to add a further storey or they could remain as floor tiles. A further possibility would be to manufacture shaped hollow tile blocks as infill between inverted reinforced concrete T-beams. The Red Brick Factory has already started pilot production of this product.

Ceramic Ware

All of the glazed wall and floor tiles now used in the YAR are imported; otherwise, locally made cement tiles of generally poor quality are used as a substitute. If sanitary ware manufacture could be integrated with ceramic wall and floor tile production, overheads would be reduced and the overall operation rendered more competitive than it now appears to be. Siting is a crucial problem, but a recent geological survey suggests that a suitable clay is available in the coastal region between Al-Mansuriya and Hodeidah. This is an excellent location for general distribution, and there is also an abundant supply of water which is a major economic factor in tile production.

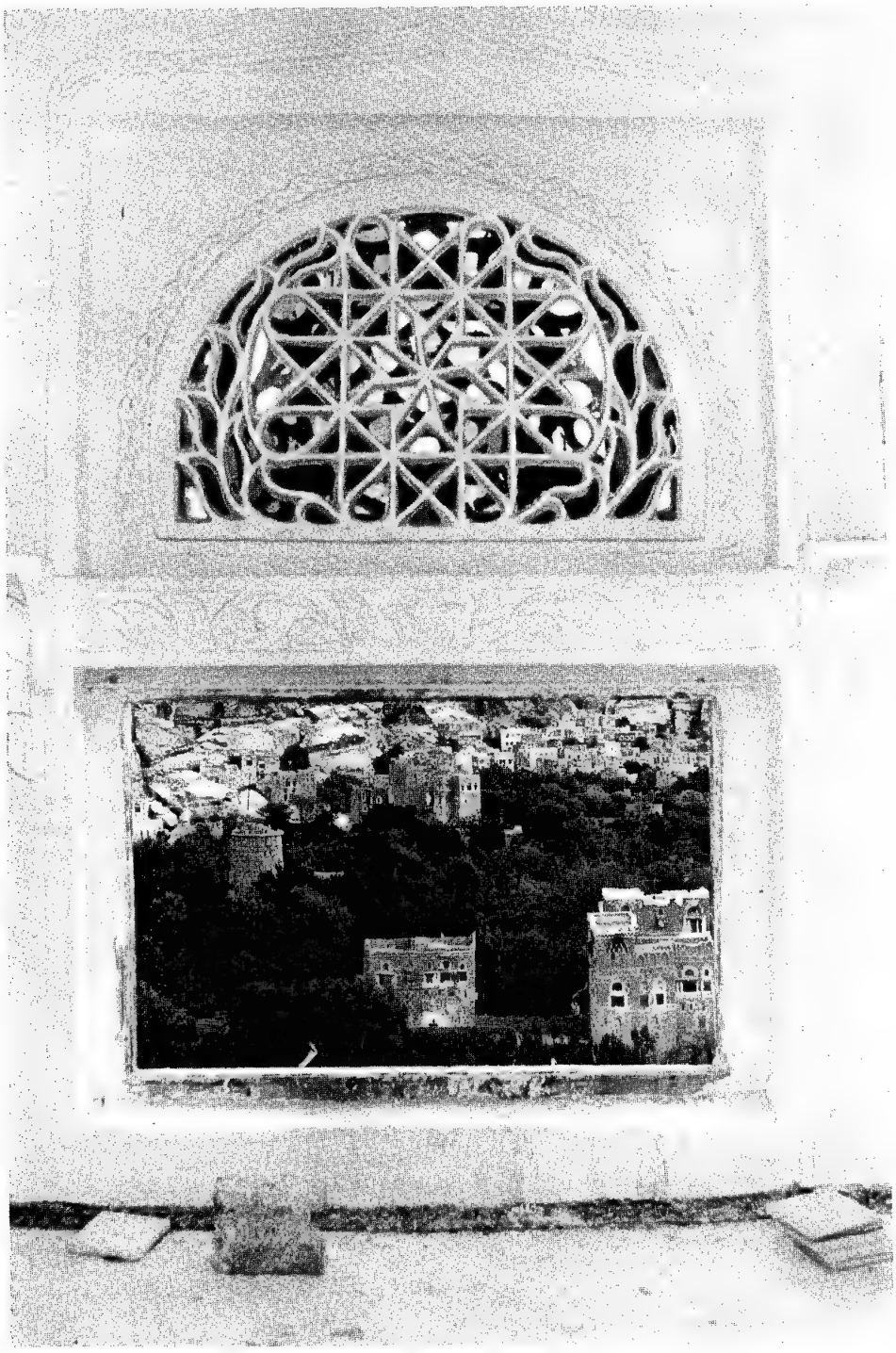
There exist a number of studies on the manufacture and marketing of ceramic clay products in the YAR. Particularly noteworthy is a report and pre-feasibility study on the production of ceramic tiles prepared by the CP as part of a general survey of construction materials in early 1979.[4] This report recommends the establishment of a plant to produce 150,000 sq. m. each of wall and floor tiles in the Tihama plain. The total investment cost is estimated at about US$11.5 million.

Timber and Timber Products

The YAR has no remaining forest areas, and timber of acceptable quality is wholly imported. It is therefore not competitive as a structural medium and its use is generally confined to applications where substitution is difficult, such as doors, frames and shuttering. The woodworking industry in the YAR is presently based on numerous small workshops using imported sawn timber. The high cost of timber joinery is a factor in the increasing popularity of aluminium window frames and metal furniture, and there is likely to be increasing scope for re-usable steel formwork systems in reinforced concrete production.

Gypsum

"Goss" is a soft white plaster consisting of calcined gypsum, and its traditional use is as a mortar in stone and brickwork walls in the mountain areas where rainfall is light to moderate. The material is also used internally as a plaster, sometimes carved for decoration or moulded to form a narrow shelf. The most characteristic use of the product is in the intricate perforated plaster carved screens or "quamaria". These screens are decorated with stained glass (or sometimes now coloured plastic) and are built-in above doors and windows. The plaster quamaria is surmounted by a protective semi-circular arch and continues to provide a distinctive and attractive feature in contemporary Yemeni architecture. Goss is occasionally used for decorative external plastering (more frequently, as a window surround), but it is unsatisfactory for this purpose, as the surface requires annual renewal by the application of a whitewash to repair erosion by rain.



Wadi Dahr. Gypsum window detail from the interior of the old Imam's palace.
Photo: C. Little/Aga Khan Awards.

Gypsum is the raw material for producing "goss", and it is currently produced in small-scale operations of limited efficiency and under working conditions that are unhealthy and sometimes dangerous. These small-scale operations are mainly located around Sana'a and Ta'izz. Gypsum is also mined for use in the cement manufacturing plant at Bajil. Total current production for the small kilns in the Sana'a and Ta'izz areas is estimated to be of the order of 10,000 to 15,000 tonnes per annum, and an additional output of about 9000 tonnes per annum takes place in the al-Salif district to supply the Bajil cement factory.

Gypsum reserves of varying quality are believed to be around 20-25 million tonnes, although no systematic mapping of known deposits has been done. The reserves are favourably distributed, large reserves being located conveniently close to the regional centres of Sana'a, Ta'izz and Hodeidah. A team of geologists from the Austrian University for Mining and Metallurgy, under contract to the CP, investigated the gypsum deposits at al-Gheras and al-Salif in April 1979 and outlined the basic steps required to improve and further develop the industry.[5]

Apart from its direct use in building, the general market for gypsum is likely to grow considerably since requirements for the cement plant at Bajil will increase in line with cement production and demand will also be created by the new cement plant at Amran. A further demand will stem from the agricultural sector and for paint manufacture.

Cement and Cement Based Products

Cement: Cement is the basic material used for modern construction in the YAR. It is mainly used in mortar and for structural elements of reinforced concrete, hollow blocks, floor tiles and various screen elements. The estimated cement consumption for 1980 was about 900,000 tonnes, of which only 80,000

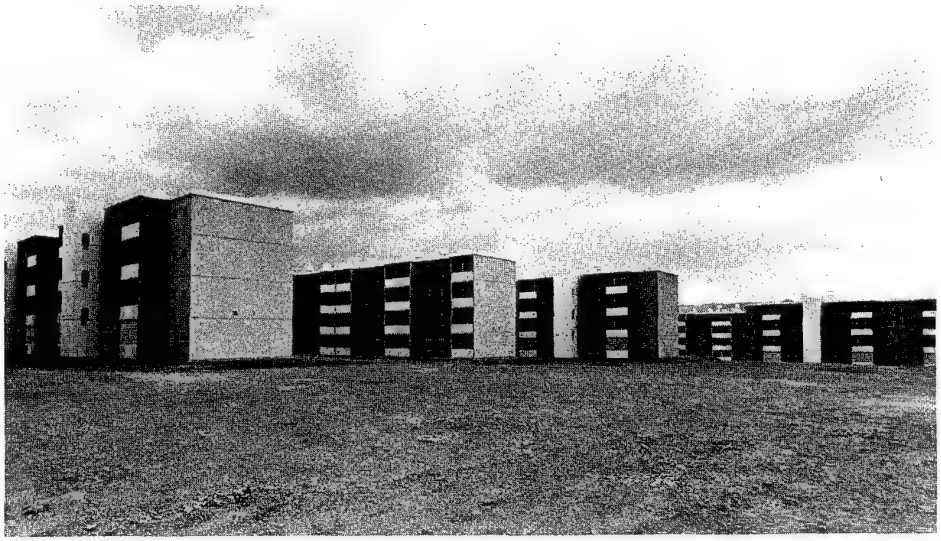
tonnes were locally produced at the plant at Bajil. The importation of cement results in a major foreign currency expenditure (US$55.4 million in 1980). The government rightly places high priority on measures to increase local cement production, and thereby reduce dependence on foreign supplies.

Bajil Cement Plant, a public sector enterprise, is the only cement plant currently operating in the YAR at a production level of 50,000 tonnes annually. The equipment is of USSR origin and has been in constant use since 1973. At present, the plant management is encountering problems in producing cement that meets international standards. The government is building an extension to the existing plant which would increase the capacity to 250,000 tonnes at a cost of YR 258 million (US$57.3 million). The extension is scheduled for completion by the end of 1982.

Amran Cement Project: Construction at a site 48 km northeast of Sana'a was started in November 1980 by IHI of Japan, and the plant is projected to start producing cement at the end of 1982. The production capacity is estimated to be 500,000 tonnes annually. The total cost will be in excess of the originally estimated YR 500 million (US$111.1 million). Consideration is being given to a later doubling of capacity to 1 million tonnes per annum.

Mafraq Cement Project: The CPO in 1978 employed the French firm of BCEOM (Bureau Central pour les Equipments d'Outre Mer) to undertake a feasibility study for a 500,000 tonnes annual capacity plant to be located west of Ta'izz. It is being considered for inclusion in the next five-year plan.

All cement plants in the YAR are public sector companies responsible to the Ministry of Economy, which also regulates cement imports. If the annual capacity of the Bajil plant is expanded to 250,000 tonnes, the Amran plant's production is increased to 1 million tonnes, and the Mafraq plant is built, the YAR could become a major supplier of cement in the region. Even if the proposed plant at Mafraq is not built, Bajil and Amran should have sufficient production capacity to meet all local demands.



Sana'a region. Newly constructed reinforced concrete housing.

Photo: C. Little/Aga Khan Awards.

Pre-cast Concrete Blocks: are most readily available pre-cast products in the YAR, most of which are produced in the standard size of 20 × 20 × 40 cm. There are large automated concrete block plants in Sana'a and Ta'izz producing blocks of adequate dimension and strength. However, they are operating at only 20 to 25 per cent of capacity, due to fierce price competition from the many small entrepreneurs who have been attracted into the industry. Throughout the country, there are numerous small yards with two to five workers producing from 300 to 600 standard blocks per day. The quality and bearing capacity of these blocks is uncontrolled and often inadequate for structural use. In many yards, the casting moulds are badly worn, the vibrating and compaction equipment is inadequately maintained, the raw materials are of variable quality, and the cement content is often reduced to save costs. In addition, curing procedures are sometimes inadequate. As a result, many of the blocks are unsuitable for installation in load-bearing walls.

On small and medium-size projects, there are no inspection procedures to restrict the use of blocks of poor quality to non-structural applications. As with other building materials, there is an urgent need for nationally-agreed standards backed up by effective inspection procedures. In general, there are advantages in encouraging the small entrepreneurs to upgrade their production techniques, as they provide investment and employment opportunities, as well as ensure a free market and so restrict the tendency to oligopoly control of prices.

In assessing the comparative merits of concrete blocks, a factor that should be considered is the consumption of water during mixing and curing. Particularly in Sana'a the water table has dropped alarmingly in the last two years and any water intensive manufacturing process should be carefully reviewed. It is important that supplies to block manufacturers should be based on fully realistic

price structures and properly metered in order to ensure that the ultimate price structure reflects a fair comparison with natural stone and brick.

Assistance and advice could also be given on diversification into new product lines, such as pre-cast concrete lintels and sills. Lintels and sills are currently either poured in place or pre-cast on site. There would be a useful market for a series of standardised pre-cast products if quality could be assured. Once facing bricks have been accepted for use in exterior walls of cavity construction, a market will develop for 10 × 20 × 40 cm concrete back-up blocks. These blocks could also be used for erection of interior partitions, provided that they are uniform in size and meet load-bearing requirements. A further potential market would be pre-cast stairway items (separate or combined rise and tread, finished with mosaic), but full pre-cast stairways would only be justified for mass production housing projects, and are unlikely to be viable. There will also be a growing market for a wide range of somewhat more sophisticated pre-cast products, provided that quality standards are acceptable. There is currently some dispersed production of items such as paving slabs, curbs, inspection chamber covers, and even concrete pipes (not pressure pipes), but these products are highly variable. Other possible products are fencing posts, rails, balustrades, sanitary fittings and septic tanks. If hollow clay tile flooring/roofing is developed, there would be a potential market for pre-cast T-beams.

In view of the continuing large national programme of water and sewerage projects, there would appear to be potential for local concrete pressure pipe production. At the request of the Ministry of Municipalities and Housing, the World Bank/UNIDO Co-operative Programme conducted in December 1980 a survey of the market for pipe and other concrete products, which could support the setting up of a manufacturing plant. The resulting feasibility study for a concrete products plant provided the market data, capital costs, operating information and costs, and profitability projections for a 24,000 cubic metre (60,000 tonnes) per year plant.[6] The proposed location is in the Sana'a area and the estimated capital cost is YR 40.5 million (US$9 million) at 1981 prices, including working capital.

Ready-Mix Concrete: There are at present two plants in Sana'a offering ready-mix concrete for general sale (including delivery to the client's site): Mohamed K. Own, and Abdel Madeq.

In addition, foreign contractors such as Sogex and Kharafi sometimes erect batching and ready-mix concrete facilities for their own use when undertaking large individual projects. A ready-mix concrete plant would appear to be a feasible project for Ta'izz, where the demand for building continues to be very strong (although the hilly terrain and narrow streets would inflate trucking costs).

In the Hodeidah area, a number of foreign contractors have temporarily used ready-mix concrete on large individual projects, but no permanent facility has been erected. There would appear to be potential for a combined ready-mix concrete/pre-casting works at the Highways Authority yard at 16 km east of Hodeidah, which was originally set up by the USSR team which built the Hodeidah-Ta'izz highway.

Asbestos Cement sheet finds application in roofing for industrial construction and rural and low-cost housing, where it can substitute for mud or tin. Asbestos cement pipes are used in water distribution and sewerage systems and are imported by the YAR for this purpose. Asbestos cement products are not manufactured in the YAR but are being imported in increasing amounts. Data from the Foreign Trade Department showed imports valued at YR 11.3 million (US$2.5 million) for the year 1977-1978.

A project for the local production of asbestos cement sheets and pipes was proposed by the CP in the course of a survey of building materials in 1979.[7] This project provides for the annual production of 28,000 tonnes of sheet and 25,000 tonnes of pipe. The total cost of the investment including working capital is estimated at YR 120.7 million (US$26.8 million).

Cement and Mosaic Floor Tiles: Plain cement tiles are currently used in low and middle income housing. The local product is of variable quality, but usually poor. These tiles are also used in roofing and street islands in Sana'a.

Local mosaic tile production is disorganised and dispersed, usually on a small-scale, and the tiles are generally of poor quality, with the result that higher-quality imported tiles from China, Italy, Japan and Pakistan have dominated the market. The usual dimensions of tiles are 20 × 20 × 2.5 cm and marble chips and coloured cement are used. The local tiles do not take polish, their wearing quality is unsatisfactory, and the compressive strength and dimensional tolerances are unacceptable to most customers. A further factor is that local tile producers do not produce special corner or skirting tiles. It is therefore recommended that the local tile factories be assisted to upgrade both production techniques and quality of product.

Soil-Cement: Soil-cement blocks have potential for use in low-cost housing, particularly in rural areas (perhaps through an LDA project). A simple hand press, such as the CINVA-RAM, can produce blocks of acceptable quality for self-help type projects. There are reputed to be three plants in the Sana'a area utilising CINVA-RAM hand presses. Their use could be spread to the villages through organised demonstration processes.

This could be initiated, particularly in the Tihama, where soil-cement could be used as a walling material for the characteristic thatched huts and houses. A generous roof overhang is advisable to protect this less durable walling material.

Lime Industry

Lime is a constituent of mortar and, when mixed with gypsum, makes a limewash paint. It is a chemical additive in water treatment, in iron, steel and paper manufacturing, tanning, and the sugar industry. In agriculture, it is used to neutralise soil of high acidity.

Limestone is abundant in the YAR, and lime is readily available, although the production methods are highly dispersed and very primitive. The manufacturing procedure for lime involves placing limestone blocks in a kiln and then burning by blowing liquid fuel oil from below. In the YAR, this method leads to technical problems, such as over-burning uniformly the limestone and wasting fuel due to inefficient combustion. Thus the quality of lime is generally inadequate, and lime is imported whenever quality is important. There would be considerable benefits to be gained from upgrading lime manufacture in the YAR.

Sand and Aggregates

Sand: Although sand is abundant in the YAR, a considerable proportion of the resource is not of the quality required for use as an ingredient in concrete, mortar or plaster. For example, in the Sana'a area, much of the sand has an excessive amount of silt and loam which is particularly detrimental to concrete quality. Some of the loam can be removed by vibration and sieving, but washing (a comparatively expensive process) is required for its complete elimination. The equipment to wash 500 to 600 cubic metres of sand per day would cost US$75,000, plus another US$15,000 for a water recycling plant. Since the design strength requirement for most of the concrete used currently in the YAR is of the order of 2,500 to 3,000 PSI, the quality and grading of sand has not been a serious problem, as the strength could be brought up to an acceptable level by increasing the cement content. As the testing facilities at the MPW laboratory develop, all sand pits should be required to submit samples for testing and grading, so that concrete and asphalt mixes can be properly designed. Any pit showing a continuing excess of detrimental ingredients should be restricted to the supply of sand for non-structural uses.

Crushed Rock: As-dug aggregates suitable for concrete works are available in the vicinity of Ta'izz, but elsewhere the main source of aggregates is by mechanical crushing of rocks found in the immediate vicinity. The Industrial Bank of Yemen (IBY) reports involvement (sometimes in loan financing, but in other cases purely in the provision of technical advice) in 20 aggregate crushing projects in recent years. Quarry owners normally purchase modern crushing plants from W.H. Baxter (11 total in YAR), B.H.S., Parker or Caterpillar. There was over-investment in the industry at the end of the construction boom in 1978, resulting in over-capacity. However, there have been recent signs of rising demand, reflecting the commencement of several large projects.

In the rural areas, there are many small (often portable) locally-owned and operated rock crushing operations that should be encouraged to improve their production methods as they effectively serve the limited requirements of the local market. Many of these crushers are out-moded and badly worn, to the extent that the aggregate cannot be properly graded for more sophisticated uses. However, the product is quite satisfactory for use in typical rural building projects which do not require high-strength concrete. Much of the aggregate used in LDA projects is produced almost adjacent to the sites by portable plants capable of crushing approximately 25 to 30 cubic metres per day. Although the daily output of such plants is strictly limited, the operators often stockpile several days' or weeks' production, in order to supply the full project needs on LDA rural road projects.

Pumice and Perlite: The YAR has useful but unexploited reserves of pumice and perlite which could be used as lightweight aggregates in concrete production. They can also be used as insulating material in modern construction.

Structural Steel and Reinforcing Rods

All structural steel is imported and is so expensive that it is rarely competitive as a building material, except in specialised commercial and industrial structures. The corrosive, salty atmosphere close by the Red Sea makes the use of untreated steel structures in the Tihama inadvisable.

In view of the growing popularity of reinforced concrete frame structures, there is a growing demand for reinforcing bars. Several studies have been made of the feasibility of setting up a steel rolling mill, most recently by the German firm Ofenbaugesellschaft Berg of Cologne. The suggested annual capacity would be 250,000 tonnes, which is much in excess of local needs. However, the proposed location is only 30 km from the new port of Mokha, so it is possible that any surplus production could be exported to other states in the region. The geological report identified ore of high quality, suitable for the manufacture of high tensile reinforcing rod.

Ironmongery and Fittings

Iron used to be smelted in Sa'ada, but this industry has disappeared and the YAR now depends on imported iron and steel. The traditional forging methods still survive, but locally-produced hinges, nails, latches, door handles and door knockers are increasingly being replaced by imported items. Action should be taken to upgrade the standards and production techniques of the more promising local producers before the traditional skills are lost.

Glass

Considerable interest in glass projects has been reported by foreign plant suppliers and investors and by local entrepreneurs. There are deposits of the principle raw material, silica sand, at several locations. An extensive occurrence at Sa'ada in the northern part of the country bordering Saudi Arabia, was found to be suitable for glass manufacture and other industrial uses, but it is relatively inaccessible at the present time.

The significance of another deposit of glass sand, at al-Jirah (Thagban), near Sana'a, was recognized by a CP mission during a survey of building materials in 1979. Samples of the sand were subsequently analysed by the University of Mining and Metallurgy in Austria. They showed outstanding physical and chemical characteristics, with a high silica content and very small amounts of iron, heavy metals and other impurities. A glass-making trial in Germany confirmed the suitability of the sand for flint as well as coloured container glass and also for window glass. This sand deposit is located near a suitable factory site with access to a main road, power supply and underground water. The CP commissioned a more extensive survey of the deposit in May 1981, including topographic mapping and analysis of additional samples. The conclusion was that the deposit could support a bottle glass project of some 15,000 tonnes annually, but that there is not sufficient high quality sand to support a flat glass plant as well.[8]

A consultant employed by CP reported in July 1981 on the consumption of flat glass by the building industry in the YAR, which is of the order of 6,000 to 7,000 tonnes per year.[9] Production of sheet glass is more complex and capital intensive than bottle glass and is generally undertaken by large plants, such as the modern float glass units with a capacity of 150,000 tonnes or more of saleable glass per year. Under favourable conditions, plants of 30,000 or even 15,000 tonnes per year may be viable, but the YAR is likely to take several years to reach this level.

Paint

Paint is produced in the YAR in only one plant at present. A particular problem facing paint manufacture in the YAR is the need to meet two distinct climatic conditions: the predominantly dry heat of the highlands and the salty, moist heat near the coast.

The National Paint and Chemical Company has a modern plant at Ta'izz. Pilot production started in 1972, and by 1976, the firm was producing paint in accordance with international specifications. The single shift capacity of the existing plant is 120,000 gallons per month, and current production is 60,000 gallons per month, which the owners believe to be about 60 per cent of the local market. The company employs a qualified paint technologist, has a small research and testing laboratory, and has devised special paint to meet the exacting standards required for hospital use. The firm complains of unfair competition due to price under-cutting by retailers of inferior foreign paints, and has conducted comparative scrub tests, which show that their product is much more durable and better fitted for the severe climatic conditions that affect painted surfaces in the YAR. Partly to obtain access to a reputable and accepted trademark, the company recently concluded a licensing agreement with ICI to produce that company's well-known Dulux line of paints from January 1981. This required certain changes in equipment and manufacturing techniques, but ICI was generally impressed with the standards and expertise of the local company. ICI specialists will also advise on marketing and general management techniques and will appoint the YAR firm as import agent for specialised lines for which there is insufficient demand to justify local production.

A second, but smaller, paint factory in the Ta'izz area is reported to have concluded a licensing agreement with Crown paints, another UK based company.

PVC and Other Plastic Products

The National Company for Sponge and Plastics Industry Limited, Ta'izz, produces high quality rigid PVC water and sewer pipe from 20 mm to 200 mm in diameter, together with a limited supply of the most popular fittings. The water pipes are produced to specification DIN 8062, and prices per standard length of six metres (as at November 1980) ranged from YR 14 for 20 mm OD (wall thickness 1.5 mm/pressure class 16 kg/sq. cm.) to YR 664 for 200 mm OD (wall thickness 9.6 mm/pressure class 10 kg/sq. cm.). The sewer pipes are to specification DIN 19534 and cost YR 120, YR 224 and YR 318 per standard length of six metres for the three outside diameters of 110 mm, 160 mm and 200 mm, respectively. The pipes are available in 6 and 9 m lengths with plain ends or one end expanded, and integral joints are available at extra cost.

It should be noted that the prices quoted include delivery charges, and discounts are given on bulk purchases. The plant has advanced equipment, appears well-managed, produces products of high quality, and has already developed a small but growing export business. The company also produces electric conduit, and is actively considering other opportunities for diversification.

Fiber glass storage and septic tanks are manufactured in Sana'a by Saeed Ralpa-Jaru Industries Ltd, a YAR-Indian joint venture. PVC ceiling tiles and plumbing fixtures are also being produced in Sana'a by YEFCO, but production is only on a pilot basis, and the quality of the finished products is not yet acceptable.

Projects to Introduce New Building Materials

It is true that a great variety of walling materials would be generally welcomed by architects in the YAR as widening the scope of design possibilities. The desire for increased variety of surface texture is indicated by the fact that facing bricks have been imported from the United Kingdom for certain specialised purposes.

The government has received at least one proposal to erect a factory for sand-lime brick. A proposal to erect a plant to produce 9,600 cubic metres of sand-lime bricks per annum (along with the manufacture of 33,000 tonnes of lime) was submitted to the government by the Krupp Group and Generale Impianti together with a local sponsor in April 1979. The investment cost was estimated at YR 252.5 million (US$56.1 million). The project has not been implemented mainly because of doubts regarding the market for the product. On cost grounds, it is unlikely that sand-lime bricks could compete with concrete blocks unless they are accepted for facing at a premium price.

A project to produce reconstituted stone was presented to the government by Norce International and a local sponsor about three years ago. The proposal is to produce standard reconstituted textured and coloured load-bearing blocks based on natural coloured aggregated. A plant to produce 6.5 million blocks annually would have cost YR 33.8 million (US$7.5 million) in 1979. The claimed advantage of this product is 50 per cent reduction in the main frame of a house. The project has been delayed apparently because of uncertainties regarding the market.

Distribution of Building Materials

Important contributors to the high delivered cost of building materials are the cost of handling, warehousing, transport and delivery. By the time a given material has reached its final destination, its cost may be double or triple the c.i.f. value in Hodeidah, the port of entry. In addition, there is an understandable and sometimes justified view on the part of independent contractors that excessive profit margins are extracted by merchants taking advantage of restricted competition. Reliable disaggregated figures for the cost of distribution were not available, but it was clear that the high cost of buying and running trucks and other road vehicles in the mountainous terrain of the YAR is a major cost factor. Fuel and labour are particularly expensive. Most imported building materials are shipped to Hodeidah and then hauled in heavy trucks to Sana'a or Ta'izz for redistribution unless the ultimate destination is in the Tihama. The only return load that is normally availabe is rough-cut stone from the quarries in the highlands, which makes only a marginal contribution to overall running costs.

There are no railways in the YAR, and the construction of a railway system would not be economically feasible in view of the mountainous terrain. Therefore, road transport will continue to be the sole means of distribution.

Unless a local source of oil is located or the labour costs for drivers and mechanics declines, it is likely that the cost of truck operation will at least keep pace with the general level of inflation. Thus, the cost of distribution from central plants should be fully taken into account in feasibility studies relating to new investment in building materials production. Where a choice of site is available, the inference should be that the mean distance between producer and user should be minimised, thereby reducing overall haulage costs. Where there is a choice between centralised and dispersed production using small-scale factories and basic technologies, the latter is to be preferred as it will ensure that many more potential users will have access to the products at reasonable cost.

Recommendations

In summarising the foregoing sections, there are many recommendations to make regarding the local production of building materials. In the YAR, this field of activity is in its infancy, and, given the mineral resources of the country, there is much that can be done, both by the public and the private sectors. While small and medium scale operations in the private sector should be encouraged for activities such as gypsum production, rock crushing, and the making of concrete blocks, for example, there are other industries, such as mechanised stone quarrying and cutting, marble production, diversified concrete products and the manufacture of ceramic tiles, that would require substantial investments and, possibly, the participation of the public sector in joint ventures.

The National Company for Industrial and Construction Materials (YEMROC) was purportedly created by the government to invest in building materials industries as well as to grant licenses for the exploitation of the YAR's mineral resources. Whether or not YEMROC succeeds in implementing projects on its own is yet to be seen, but the mechanised stone quarry project supported by UNIDO and the World Bank will be a good test of YEMROC's intentions as well as its managerial capability.

Information on the mineral resources of the YAR is scarce and incomplete. Geological surveys of the most important mineral deposits must be carried out in order to determine the quality and quantity of the material on which industries can be based. There have been a number of superficial investigations over the years, mostly financed by bilateral aid, but little effort has been made to coordinate this work and put it to practical use. General surveys have rarely been followed by detailed work, which is essential. Other recommendations are:

1) Encourage the establishment of standards, including laboratory testing, to

Table 7 **Domestic Employment Trend 1975-1985** ('000)

	Construction Employment	Total Employment	Construction As Per Cent of Total
1975	48.7	1,059.9	4.6
1980	148.6	1,331.3	11.2
1985	215.7	1,543.6	14.0

Source: World Bank, Manpower Development in the Yemen Arab Republic *(Washington, D.C. 1980).*

provide for lower cost, better quality and greater safety, in respect to all building materials.
2) Provide technical assistance to upgrade the current technologies for the production of lime, gypsum, burnt clay bricks, cement and mosaic tiles, and concrete blocks, and for the practical usage of mud and soil-cement blocks as building materials.
3) Implement projects to lower the cost of natural stone and, thus, assure the continued usage of this fundamental and popular building material.
4) Base new industries on known deposits of marble, pumice, perlite, gypsum and sand for glass production.
5) Introduce the manufacture of new products, such as ceramic tiles, concrete pipes and poles, sand lime bricks and reconstituted stone, where supported by thorough studies of the market and technical feasibility.
6) Encourage the usage of low cost materials for low cost housing, such as reinforced mud and soil-cement blocks.

Manpower, Education and Training

Labour Availability and Employment

According to the 1975 census, the resident population was around 5.2 million and the migrant population (both short and long term) 1.2 million. The total recorded potential labour force was around 1.4 million, of whom almost 20 per cent were working abroad. Of the remaining 1.1 million domestic workers, the bulk (90 per cent) were employed in the private sector, primarily in traditional activities.

The majority of workers (78 per cent) were employed in agriculture, 12 per cent in trade and services, 5 per cent in construction, and the remaining 5 per cent in all other sectors combined.

Firm information on employment trends from 1975 onwards is not available, but an estimate based on trends in value added and productivity is given in Table 7.

The growth of construction industry employment appears to have been dramatic, both in terms of absolute numbers and as a proportion of total employment. This goes some way to explain the remarkable rises in wage levels and the tendency of contractors to seek to reduce the labour content in their operations by investing in mechanical plant and other labour-saving equipment. Although manpower shortages in the construction industry affected both skilled and unskilled workers during the years of peak growth, the contractors interviewed by the Mission reported that there is now no problem in recruiting unskilled workers. The recent World Bank Manpower Mission reached the same conclusion as a result of "fairly consistent responses from many agencies of the public and private sectors in Sana'a, Ta'izz, Hodeidah and locations along the road that, by and large, 'there is no problem in finding unskilled workers' ... If this impression is correct, then increases in wage levels should level off and would actually drop in real terms." The Manpower Mission, however, enters the caveat that "this is a difficult prediction to make in view of the linkage of the Yemeni labour market with those of surrounding countries."[10]

Labour migration from the YAR to other parts of the Arabian peninsula has taken place over the past 25 years at least. However, in recent years the intense demand for labour in neighbouring oil producing countries has translated into highly attractive wages that caused large numbers of Yemenis to cross the border, primarily into Saudi Arabia but also to other parts of the peninsula. By 1975 Yemeni migrant workers accounted for almost 20 per cent of the total Yemeni work-force and remitted an estimated YR 1.7 billion (US$375 million) to the Yemeni economy. These remittances increased dramatically to YR 6.5 billion (US$1.4 billion) in 1979.

Yemenis abroad may be divided into two broad categories: long-term emigrants and short-term migrants. Information about the first group is sparse, although it is known that they are scattered widely in Africa, Asia, Europe and America. Although some of these emigrants return either to augment the local labour force or to stimulate employment by investing in local industry, it is the second, and much larger, group of short-term migrants that have a substantial effect on the manpower situation and on manpower planning in the YAR. They work primarily in the Arabian Peninsula and mostly in Saudi Arabia, and even their numbers are in dispute since the border between the YAR and Saudi Arabia is, to a large extent, effectively "open". "Unofficial" travel is easy and frequently goes unrecorded. It is generally believed that the greatest number of Yemeni migrant workers are of rural origin and unskilled. Many work on construction projects, and it is very likely that the number of Yemeni construction worker in neighbouring countries is in fact large than the construction work-force inside the YAR. Some of them intend to con-

tinue to work abroad, returning home only to visit their families and spend their accumulated savings. Others aim to obtain experience and skills and to reach a specific "savings target" before returning to settle in the YAR, perhaps working as skilled or semi-skilled construction workers and purchasing a house and consumer durables with their savings. A significant number put their skills and savings to use by starting small businesses, such as repair shops, workshops and small building firms. Thus many of the short-term migrant workers are effectively subjecting themselves to a form of conversion process.

Future trends in migration are difficult to predict, making manpower planning for the construction sector hazardous. A further substantial rise in outward migration, accompanied by an internal construction boom, would result in a return to acute shortages of skilled labour and (less severe) shortages even of unskilled labour. At the other extreme, an unexpected change in priorities, policies or technology in the neighbouring countries, leading to a large number of returning workers coming suddenly onto the labour market, probably accompanied by a concomitant slump in construction demand, could result in serious and potentially disruptive unemployment. Fortunately neither of these extremes presents a likely scenario. The Manpower Report forecasts continuing shortages of skilled workers at all levels, but a surplus of as many as 191,500 unskilled workers in 1985.

Information on employment of expatriate workers is scattered and incomplete, but the Manpower Mission calculated a total of 17,000 expatriates in 1979-80, of whom 10,000 were in the private sector and 6,000 and 1,000 in the public and mixed sectors respectively. The overall figure is probably underestimated and does not include expatriate experts attached to technical assistance programmes of the various aid donors operating in the YAR. It is likely that at least 5,000 expatriates are employed in the construction industry, almost all with specialist managerial, technical or craft skills.

Education and Training

According to the 1975 CPO Manpower Survey only about 20,000 out of the total resident labour force of 1.1 million had attended primary school. However, the progress of the educational system over the last decade has been remarkable, and it now encompasses close to 4,000 primary, preparatory and secondary schools with a total enrollment exceeding 360,000 students.

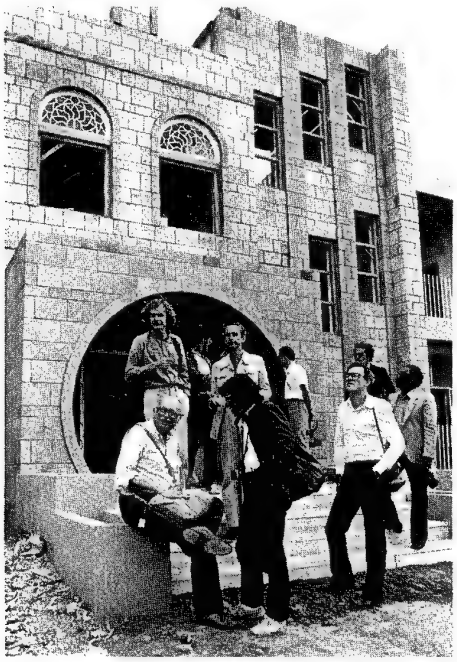
The University of Sana'a was established in 1970, and its five faculties currently have around 4,200 registered students. Both a faculty of engineering and of health sciences are being planned for the near future. In addition, a significant number of Yemenis study in neighbouring countries or seek higher education abroad either on scholarship or at their own expense.

The most serious problem facing the formal educational system is the shortage of adequately trained teaching staff and administrators. For teachers, the system relies heavily on expatriates, mainly from Egypt, whose number has increased considerably in the past few years. On the other hand, the authorities have made some progress in training qualified Yemeni teachers. Despite these difficulties, the progress made so far is encouraging and education will undoubtedly remain one of the priority areas for the YAR in the next decade and beyond.

The formal training system includes technical secondary schools, teacher training institutes, vocational training centres, district training centres and literacy programmes. A further component consists of in-service training (training of employees by the employing authority to meet its needs for special technical and managerial skills) which is conducted both domestically and through out-of-country arrangements. In 1981 a further four vocational training centres will come into operation in addition to the existing centre at Sana'a, with an anticipated output of 140 skilled tradesmen from two-year day courses at Sana'a and about 300 from part-time evening courses at Sana'a, Ta'izz and Hodeidah. By 1982/83 the annual output is expected to reach about 800 in various craft courses, about half of which are allied to the construction industry. Although district training centres only began operation in 1979-80, over 3,000 people are already involved in a variety of programmes including literacy, craft and vocational topics. In addition, the MOE's own literacy programme had over 10,400 students in 1979-80.

On-the-job training has not been documented, although it makes a useful contribution in the more progressive of the productive enterprises. Too frequently, however, on-the-job training is not planned, organised or supervised specifically as a training activity, with the result that the training is over-specific and sporadic in its general contribution.

There is a limited amount of off-the-job training in centres set up to serve the needs of particular employers. The most relevant of these to the construction industry is the Vocational Training Centre (VTC) of the Highway Authority. This Centre was first established in Ta'izz in 1971 but only commenced operations in December 1974. In 1978 the HA took over the Centre directly as part of its new training division, financed under the Third IDA Highway Project. This training division is comprised of a central administrative unit, the VTC for classroom work, and training production units for mechanical and road maintenance work, all estimated to cost US$4.24 million for a three-year programme to train some 227 existing employees, 417 new employees and 13 Yemeni instructors. The training will include the occupations of road maintenance supervisors and foremen, equipment operators and drivers, petrol and diesel engine mecha-



Site visit to an Awqaf project under construction in Hadda, a suburb of Sana'a.

Photo: C. Little/Aga Khan Awards.

nics, machinists, welders, storekeepers and accountants.

The recommendations made in this area by the Mission are the following. Proposals for a Faculty of Engineering at Sana'a University that would design courses related to the construction industry as it exists in the YAR ought to be supported. The Faculty could provide post-graduate training for returning Yemeni graduates from foreign universities to provide familiarity with local conditions and requirements.

Because the severe shortage of skilled personnel at all levels is likely to persist, the government is urged to support the expansion and upgrading of technical training facilities. The Technical Secondary Schools at Sana'a and Ta'izz and the Vocational Training Centres at these and other locations should be continually improved. Vocational day release and evening courses should be made available at training centres throughout the country in order to upgrade the skills of Yemeni artisans. Specific courses should be arranged for plant operators and maintenance personnel. General apprenticeship and trade testing schemes for skilled construction personnel should be developed. Finally, the government should award medium and large public sector contracts only to contractors operating an approved apprentice training programme.

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Earthquakes: The Vulnerability of Traditional Buildings in the Yemen

Derek Matthews

The recent earthquake has shown the vulnerability of the traditional buildings and has raised questions concerning the future of building in the Yemen. This paper describes the alien influences arriving after the revolution of 1962. It compares the traditional buildings with thick walls and roofs, suited to the climate, with the imported thin-walled versions. The philosophy of the United Nations Development Programme (UNDP) at that time is stated, and the efforts of the UNDP personnel assigned to the Ministry of Public Works to adopt a more sympathetic approach is described. The earthquake disaster is bringing in bilateral aid, but if the wrong types of rapid-aid programmes are introduced, it could be the end of the Yemeni traditions. This paper suggests criteria for taking account of the climate and the traditional patterns in building new structures, for allowing public participation and for encouraging self-reliance. The longer-term aim must be in the improvement of traditional techniques together with the application of appropriate technology. Only in this way will the Yemeni tradition survive.

Sana'a, Yemen Arab Republic.

Photo: C. Little/Aga Khan Awards.

Need for re-appraisal

The Yemeni people have created a unique architecture based on their deep cultural roots. In spite of the fact that alien influences have lately been suggesting design solutions that are not in accordance with these values, it is still a fact that the Yemeni people, who are proud of their architectural traditions, would like to continue building in hand-cut stone, rubble, as well as burnt brick, sun-dried blocks and rammed earth. These methods and materials have advantages from many points of view.[1] However, a new element has suddenly appeared: the need to re-appraise traditional building methods in the light of the events resulting from a recent and unexpected earthquake in the Dhamar province. There is a possibility that a rapid-aid programme

with bilateral assistance, if of the wrong sort, might irretrievably damage the balance of the use of local materials and building methods, causing immense harm to the cultural heritage.

The earthquake occurred on the 13th of December 1982, with a magnitude of 6 on the Richter scale, and of about 45 seconds in duration. The epicentre was located approximately 15 km north of Dhamar, and about 2 km west of the village of Risaaba. A second earthquake with a magnitude of 4 and about 3 minutes in duration occurred on the 30th of December 1982.[2] Some 1150 villages and settlements in an area of about 4000 sq. km around Dhamar were destroyed in this disaster. About 1500 people are said to have died, including many women and children who were at home or at school. It has been estimated that at least 300,000 people were left homeless; 42,000 houses became uninhabitable, of which 15,000 were completely wrecked. In addition, mosques, schools, water-supply facilities and wells, and government buildings were destroyed.[3]

Rural buildings in the Yemen are constructed with thick walls and roofs, a method having advantages from the climatic point of view. In the highland zone there is a large diurnal range of temperature (about 15° to 20°C.) so that a heavy structure can "store" the heat of the day, allowing restitution at night, and thus providing a stable indoor temperature without any need for heating or air-conditioning.[4] However, from the point of view of earthquake risk, these are the most dangerous structures.[5]

Earthquake risk

Earthquakes have not been expected in the Yemen, and precautions have so far not been taken. Indeed, a recent World Bank project was made on the following basis: "there will be no special consideration taken to seismic conditions or hurricanes".[6] The Yemeni government as well as the UNDP were not of the opinion that earthquake risk existed. The existence of so many ancient minarets and high buildings throughout the country seemed to confirm their view. However, historical accounts show that earthquakes have been felt in many regions of the Arabian peninsula, but the accounts lack detail and have limited value other than showing the area is seismically active. The entire land mass of Arabia is a tectonic plate surrounded by evidence of the epicentres of earthquakes. The Yemen is situated in an area where major or minor intensities may be expected.[7]

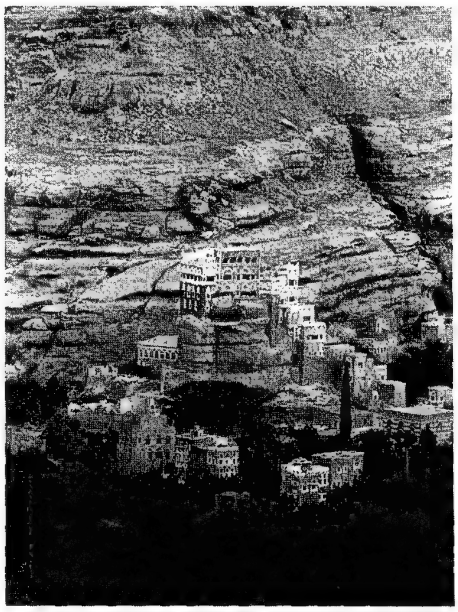
The detailed area around Dhamar is characterised by the presence of old lava fields and volcanic rock. There is evidence of a large volcanic crater rimcrest approximately half-way between Dhamar and Sana'a.[8] The local building stone named "trap" is of volcanic origin.[9]

It is known that the Yemen has been subjected to earthquakes, but data does not seem to exist before the thirteenth century. Al-Khazaji, living in the thirteenth and fourteenth centuries, has recorded the following earthquakes: AD 1258, in many places west of the Yemen; AD 1387, near Aden; AD 1394, near Mokha. An earthquake was recorded in Sana'a in AD 1666. In the last century, several earthquakes were recorded by the Yemeni historian Abdelwassi. There was an earthquake at al-Hayma, west of Sana'a, in 1873-74, and another, near Mokha, in 1896-97, and a third at Waylan, near Sana'a in 1909.[10] Within living memory, some say there was an earthquake in Sa'ada in 1944.

Attitudes towards Yemen: architecture

Until the establishment of the Republic in 1962, the Yemen had remained a largely unknown country. It was at that time that the United Nations and its specialised agencies came forward and set up a development programme. The UNDP office in Sana'a issued Information Papers in order to "put the Yemen on the map". One of these dealt with "Housing in Sana'a".[11] This paper set out the main considerations upon which UN policy was to be shaped in relation to the future physical planning and construction in the Yemen. The fundamental points were: architecture in the Yemen is of the highest standard; and housing has adapted in an outstanding way to local conditions of climate, locally available craftsmanship and low-cost building materials. Architectural design was developed in the past 2000 years so ingeniously that today we find many aspects of functional design belonging to the most recent stages of the art of architecture.

It is therefore deeply to be regretted that in a sense of falsely-understood "progress", certain circles wanted to be "modern" at any price, and despised the outstanding features of traditional



Wadi Dahr, Yemen Arab Republic. Architectural harmony is achieved in this settlement of old buildings through the use of natural materials and the free repetition of simple design elements.

Photo: C. Little/Aga Khan Awards.

Sana'a region, Yemen Arab Republic. New construction has followed many of the design practices of traditional building.

Photo: C. Little/Aga Khan Awards.

Yemeni building culture, and attempted to introduce reinforced concrete buildings. It is a fact that these foreigners came mainly from developing nations and not from industrialised countries. They spoke of cutting broad avenues through what they described as the "slums" of the Old City. Yet it is certain that no slums exist in Sana'a. It is clear that construction in the style of the Abdul Mogni Street (with its reinforced frames infilled with thin cement blocks) should be discontinued.

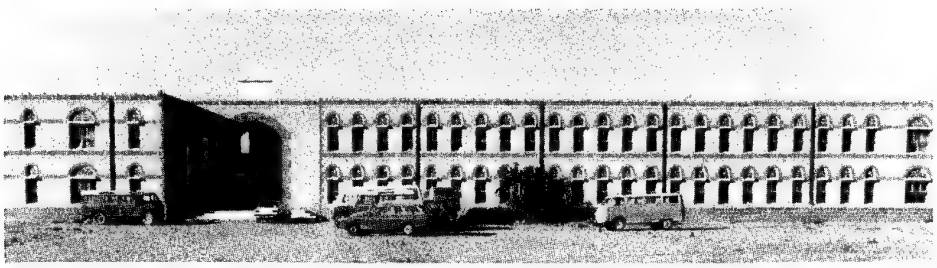
It is well known by those who have to live in these modern concrete houses that they are much less comfortable than the traditional buildings with thick walls and roofs. The modern structures are hot in summer and during the day, and cold in winter and during the night because of the thin walls and roofs. They also require expensive maintenance because their facades do not have naturally weathering materials.

The UN Food and Agricultural Organisation tried to be "modern" and "fast" by importing prefabricated houses for the UNDP/FAO Wadi Zabid Project. It took a full 19 months (September 1968 to May 1970) for these prefabricated houses to be erected. They proved to be a nightmare of inconvenience during the hot season. About 60 per cent of the total cost ($240,000) would have been sufficient if the project had been built with local materials and labour. Similar considerations apply to some new school buildings erected in an alien style and method. In both cases, a large proportion of the cost goes into the pockets of a few contractors, with only about 25 per cent remaining in the country. If we expect rural communities to participate in self-help for construction, then care must be taken to ensure that the money collected will remain in circulation within the community itself, in order to create an incentive and feed-back for such local development as agricultural inputs (fertilizers, seeds, tools) and for constructing rural water supplies and feeder roads, etc. By recognising the high values of traditional Yemeni architecture, use may be made of these values in order to promote rural development economically.[12]

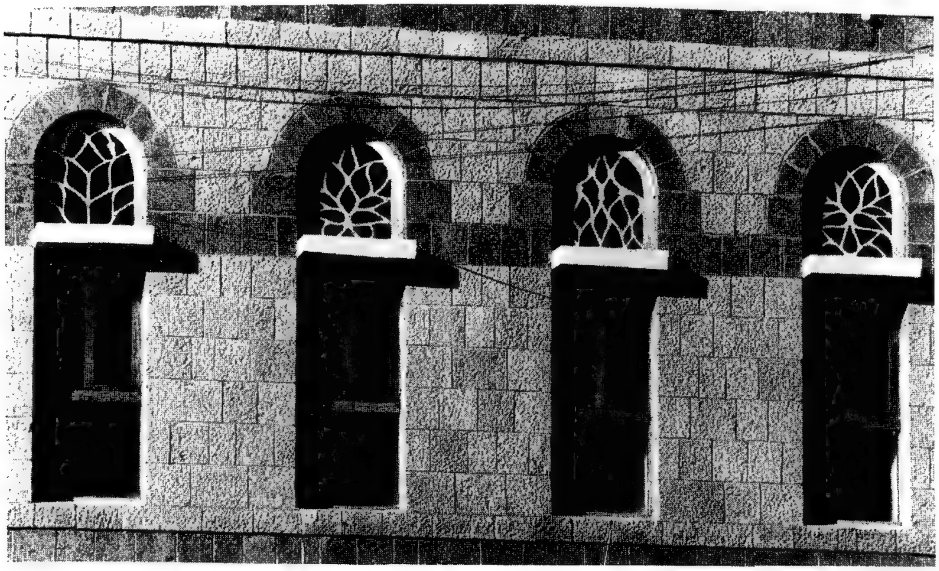
One result of this UNDP project was the successfully reversing of the trend of indiscriminate building with unsuitable imported materials. It became official government policy to construct all public buildings in Yemeni stonework, using highly skilled local craftsmen. This ended the mere copying of foreign building styles, and stimulated the growth of a modern Yemeni architecture, blending well with its environment.

The value of Yemeni architecture and the concept of harmonious use of local traditional skills and materials in modern buildings has now become widely accepted. The architectural assistance to the Design Section of the Ministry of Public Works in Sana'a was being continued by the UNOTC architect (the author) who arrived in April 1972, and fully supported the basic principles of these policies. Continuous alertness remains essential so as to prevent aberrations by individuals, ministries, and bilateral aid donors. Vigilance is necessary, since there is still a tendency amongst local contractors (who originate from Ta'izz or Aden where traditional architecture and skills of the Sana'a level do not exist) to inflate their estimates on construction in local materials, because their profit margins in concrete construction are higher.[13] A major break-through occurred when the government Guest House in Sana'a was constructed in solid load-bearing masonry. It then became a requirement for new official buildings to respect Yemeni traditions, both from an economic and aesthetic point of view, and the Design Office in the Ministry of Public Works fully subscribed to this policy and implemented it.[14]

Another important landmark appeared in 1971, previous to the Guest House, when



National Institute of Public Administration, Sana'a. South elevation.
Photo: courtesy D. Miles.



National Institute of Public Administration. Stonework detail.
Photo: courtesy D. Miles.

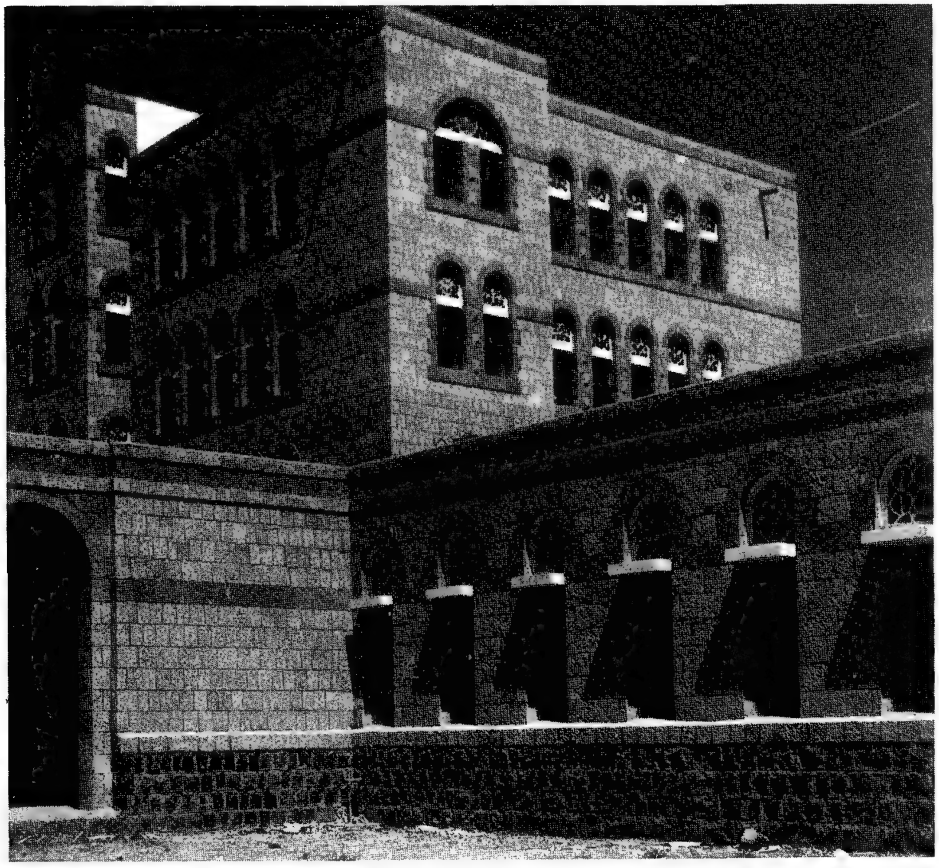
the government decided to build the new offices for the Ministry of Foreign Affairs in local hand-cut stone instead of the reinforced concrete-framed structure filled in with thin cement blocks, then more usual. This decision was due to the efforts of the UNOTC Planner and architect Alain Bertaud. Following this, and according to the same philosophy put forward as the UN policy, many other projects were undertaken including hotels in Hodeidah and Sana'a, extensions to the small hospital in Sa'ada, and fish processing plants in Hodeidah and Mokha.[15] Several major public buildings were designed and constructed in local materials through the Ministry of Public Works, including the National Institute of Public Administration, the Health Manpower Institute, and the Ministry of Justice. The former Palace, Beit 'Ali, was converted into Al-Hamd Palace Hotel, with extensions at roof level in traditional style and building method. Other projects successfully completed included the International School, a School of Nursing in Ta'izz, the second phase of the Health Manpower Institute, and the Provisional Health Centre and Hospital, with staff housing at Dhamar. The World Bank Education Project followed the same precepts.[16]

Documentation

Whereas rural building, and even low-cost work in the towns, was still being carried out with local materials, it was thus proved that sophisticated work can also be done in the same traditions.[17] The structural improvements since proved to be adequate in avoiding undue damage in the recent earthquake, and having good stability resistance.[18]

The principle has been summed up in a film by Vladimir Bibic and Derek Matthews for the UN Conference on Human Settlements held at Vancouver in 1976. The film describes the failure of attempts made in the Yemen after the revolution of 1962 to introduce western-style building methods using thin walls and unnecessary reinforced concrete framing. It shows the alternative of using local materials as far as possible, which respond to the needs of development, and at the same time conserve the harmony of the architectural heritage. It illustrates important economic advantages, for when local materials are used, the benefits are spread over the population at large, whereas if an imported system is used, the local building industry does not benefit, and the profits flow out of the country. An inferior product results, for the inevitable thin walls do not have sufficiently high performance standards to satisfy local conditions.

The content of the film was used together with other material as a basis for a large exhibition entitled "Building in the Yemen" which showed by means of photographs, etchings and lithographs the architecture, landscape, people, and the



Health Manpower Institute, Sana'a. Internal Courtyard.

Photo: courtesy D. Miles.

Health Manpower Institute, Sana'a. Entry adjacent to administrative block.

Photo: courtesy D. Miles.

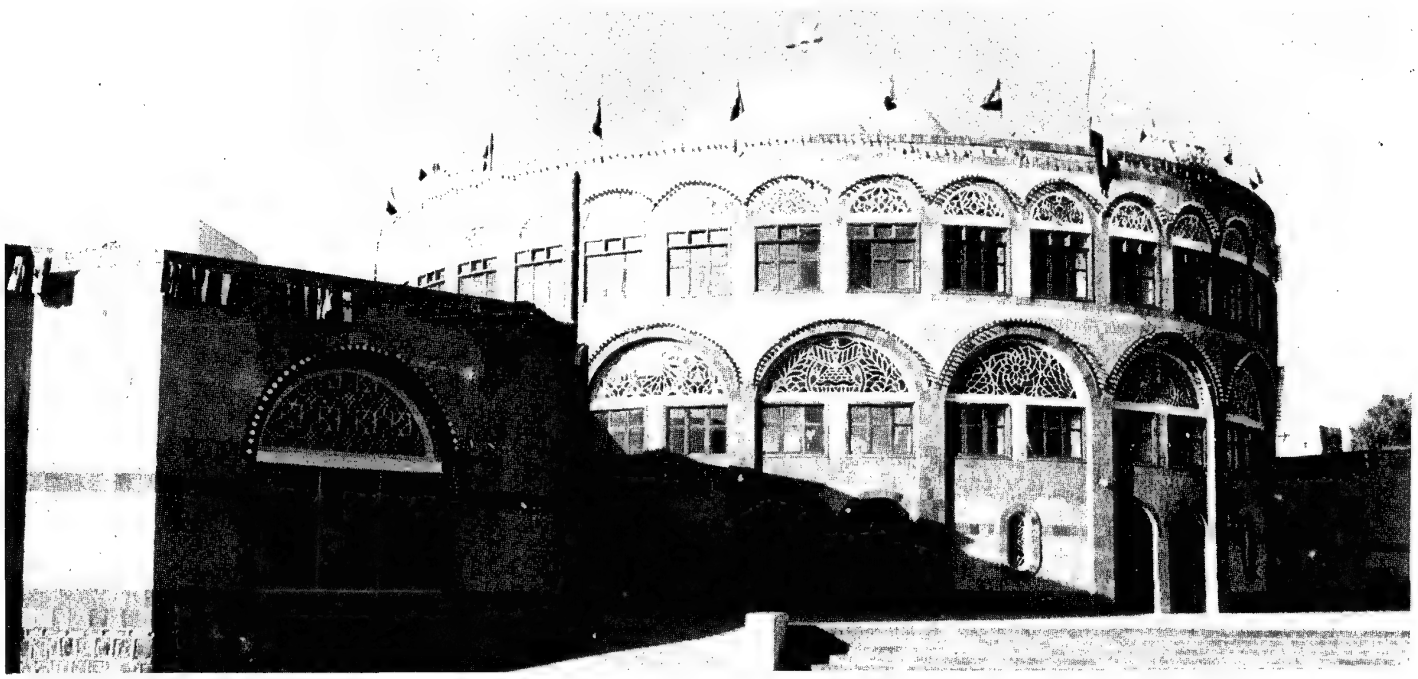
building materials and traditions of the country.[19]

The film drew attention to the fact that there has never been an acute housing problem in the Yemen, and the people have had the skill to satisfy their needs. Housing in the villages is carried out by families, who also help each other. Rural housing, such as that which has been destroyed by the recent earthquake, is entirely of the "self-help" category, and it does not come under any description of public sector housing, nor that of private developers. Every Yemeni is a natural builder and a mason. The unique architecture is a product of the involvement of the people themselves.

Proposals

Schemes now being proposed to rebuild after the earthquake damage must take into account the fact that so-called "turn-key projects" are explicit examples of the wrong approach. The local people must be involved at every stage of the decision-making process, and especially in the execution.[20] It follows that certain criteria, such as the following, must apply: to use local materials, skills and technology, and even labour-intensive methods; to ensure the saving of energy; to respect traditional patterns; to respond to climate; and to encourage public participation and self-reliance.[21] In setting up a programme for rebuilding after such a disaster, the first decision to be made is to establish how much protection from earthquakes can be provided. Clearly it is possible to construct houses that will withstand any intensity, but this is not feasible on a large scale for reasons of cost. In the words of a UNESCO mission, "The purpose of earthquake-resistant design is not to prevent all damage by severe earthquakes, for such an objective would result in unreasonably expensive structures. The aim is first to ensure against loss of life or injury, and then to balance the cost of additional measures against the probable cost of repairing damage during the expected life of the structure". It should be added that where money is very scarce, then the main object must be to prevent the collapse of buildings and consequent loss of life. One must expect buildings to crack, and the need to repair them if there is a major earthquake.[22]

When making proposals for rebuilding, it is not sufficient only to be concerned with structural stability. Not only must the structure be strong enough to withstand an earthquake, it must also have the ability to satisfy climatic requirements, so as to provide conditions in the

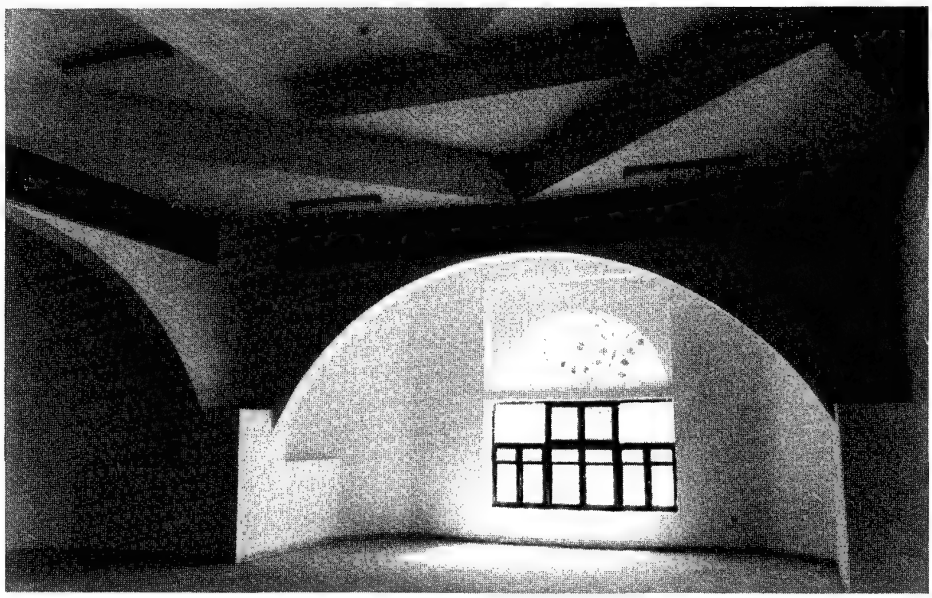


Ministry of Justice, Sana'a. Main entrance.

Photo: courtesy D. Miles.

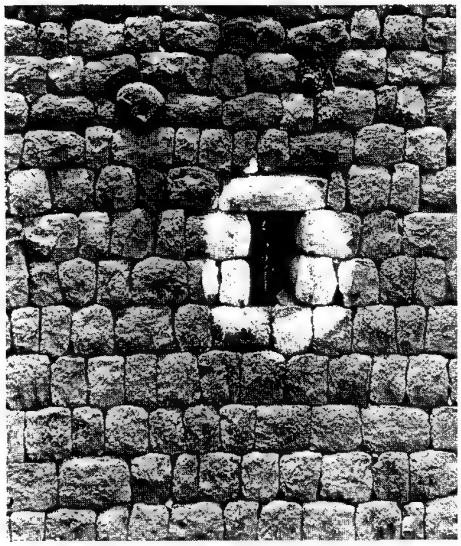
new house as comfortable as those in the structure which it has to replace. Some proposals using thin walls do not satisfy this need. The problem here is that heavy walls and roofs are prone to extreme damage.

There is a short-term problem at present in the Dhamar area, the immediate requirements to help those who have lost their homes; for the long term, the need is to ensure self-reliance. In considering the former, rapid-aid programmes are now being proposed using mass-produced components. It is known that the government might favour systems with pre-cast elements, but not complete prefabrication. Some bilateral donors are, of course, suggesting systems which have the emphasis on strength against earthquakes, but which ignore climatic requirements and comfort conditions inside the houses, as the proposed wall thicknesses are inadequate.



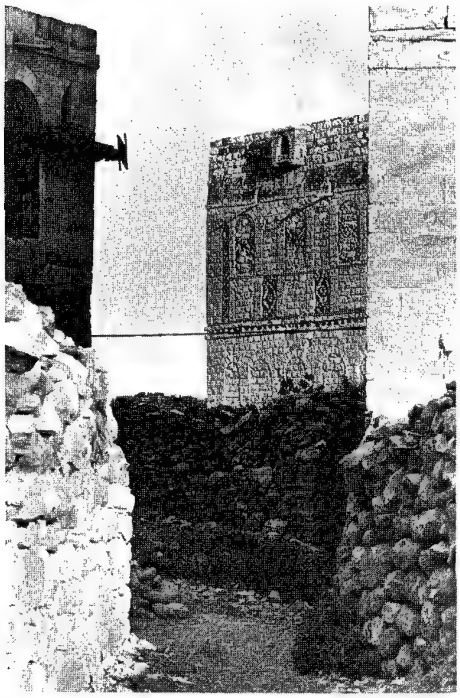
Ministry of Justice, Sana'a. Interior of Hall.

Photo: courtesy D. Miles.



Detail of exterior stone wall with projecting wood beams.

Photo: C. Little/Aga Khan Awards.



Kawkaban, Yemen Arab Republic. Stone building walls with horizontal wood coursing.

Photo: C. Little/Aga Khan Awards.

Because most of the damaged settlements are in areas inaccessible to heavy transport, only building elements that are light-weight, and of limited size, strong enough to be transported in a small truck, can be considered as practicable.[23]

They should be of such a nature that the people can use any elements themselves as part of a "do-it-yourself" method. Proposals must also be in accordance with traditional ways of life, and should not require any radical changes in life-style and culture. The new structures should blend into the natural landscape.

Any rapid-aid programme should take into account the need for such items as have been listed above under essential criteria, including the maximum use of local skills and appropriate technology.[24] The short-term solution for providing immediate shelter must be seen in relation to the long-term requirement for improving local methods and techniques, thereby bringing new structures into the category which will not collapse and cause loss of life if another earthquake occurs.

To improve traditional building, it is necessary to diagnose the types of destruction that occur during an earthquake. Field surveys show that the commonest type of failure is the breaking off of the four top corners of buildings. Cracking of the wall begins at roof level where vibration is strongest. The wall then cracks and the whole of the corner shears off, and the roof falls in. The first severe shock usually does not last long enough to bring down the levels of the building below the top storey. A second shock may continue the process. The extent of cracking, of shear and collapse, depends on the strength of the materials and their bonding, which is in turn affected by maintenance. Other conditions may cause a building to collapse throughout its full height. This may be caused if the foundations move because they are badly designed and constructed, or if they move due to ground conditions, steep hillsides, or fill. Some ground conditions, such as tipped shales, magnify the transverse waves of the earthquake. A house can also be pushed over by the vibration of a cliff against which it is built, or by vibration from the collapse of neighbouring houses.[25]

Some solutions to strengthen traditional methods of building include consideration of the shape of the basic structure, the quality of materials and workmanship, and additional constructional strengthening. Detailed information on these aspects can be found in manuals.[26] Briefly, Razani's statement is true: "Save the lives of the residents by preventing the seismic collapse of the roofs. Do not worry about property damage; the houses can be repaired or rebuilt later."[27] Such techniques were already known to traditional builders, including those in the Yemen.

Techniques for strengthening walls have been practised since antiquity. The Monastery Church of Debra Damo in Ethiopia is a case in point.[28] The walls consist of tile-like stones set in earth mortar, strengthened with longitudinal beams which are themselves fixed to the walls with cross-pieces, projecting and known locally as "monkey-heads". Such a method of construction has been used as far apart as Crete, Asia Minor and Tibet. It seems to have been the normal constructional method at Axum. K.A. Cresswell states that the construction of the Ka'aba in AD 608 with alternate courses of stone and timber was the result of the employment of an Abyssinian named Baqum.[29] That strengthening of walls is a technique that was also well known to traditional builders in the Red Sea area. In Suakin, Jeddah, Hodeidah, Mokha, Luhaya, it is usual for longitudinal timbers to be built in at vertical intervals of about 1.2 metres for stability.[30] It is not unusual for timber also to be built into walls in other parts of the Yemen, particularly in the sophisticated houses of Sana'a and other towns. Possibly the shortage of timber has led to this strengthening being abandoned.

In the background, post-disaster housing in an earthquake struck village in the Dhamar area.

Photo: C. Little/Aga Khan Awards.

To conclude, therefore, long-term solution to achieve earthquake-resistant housing has to be based on the use of local materials and methods. This is particularly important in the case of the Yemen where many buildings are in rural areas, that are difficult to reach by motor transport. Moreover, as we have seen, traditional building techniques have incorporated means of strengthening walls so as to prevent the collapse of buildings during earthquakes. With further technical improvements, structures can be made sturdier, allowing thicker walls and heavy roofs which are necessary to obtain comfortable internal condition in the highland climate. Meanwhile, a short-term disaster relief is needed to provide shelter for the 300,000 homeless people in the Dhamar province. Yet, any rapid-aid programme that ignores the climate, traditional patterns of living and the necessity of public participation will be doomed to failure. It is certain that traditional techniques of building in the Yemen possess the potentialities needed to achieve adequate structures that at the same time continue in the mainstream of Yemen's cultural heritage.

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The Confederation of Yemen Development Associations and the Co-operative Movement in the Yemen Arab Republic

Barbara Croken

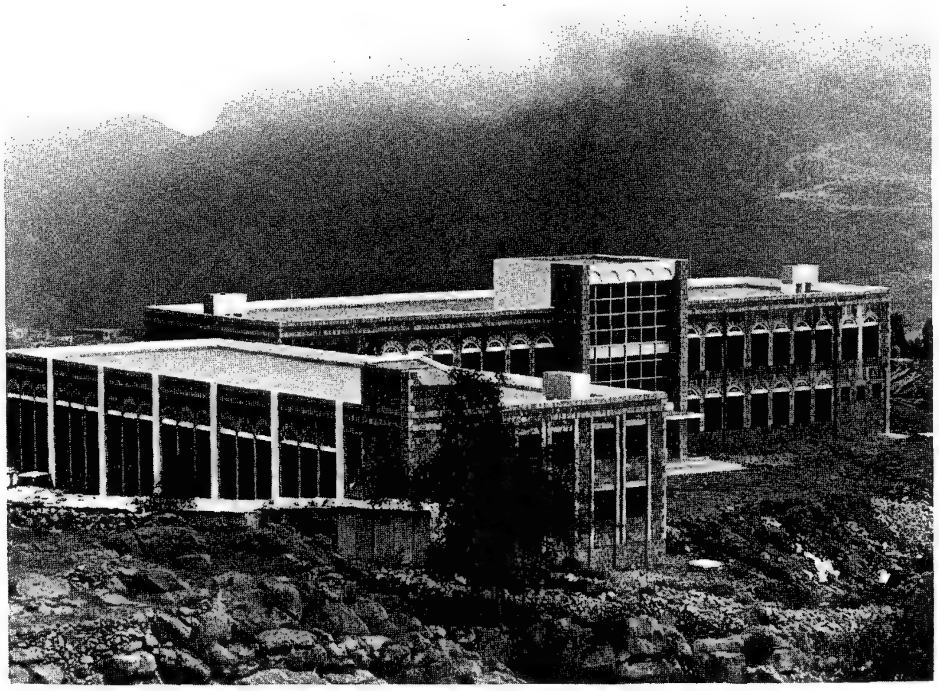
The Confederation of Yemen Development Associations (CYDA), is one of the most important branches of government in the Yemen Arab Republic today. The President of the Republic, Mr 'Ali 'Abd Alla Salih, is himself the President of CYDA. The Administrative Board of CYDA consists of representatives of the "service" Ministries of Education, Culture, Agriculture, Public Works, Finance, Social Affairs, Communications and Municipalities, as well as including among its members representatives of the Central Planning Organisation and the Yemen General Electricity Corporation. Representatives of the people elected by national elections are both members of the Administrative Board and chairmen of the major administrative committees of the CYDA. The governor of every province in the Republic participates in the operation of CYDA in his capacity as President of the Governorate Co-ordinating Council. The officers and members of the Co-ordinating Councils are selected from among the officers of officially-constituted co-operative unions organised on the district level, known as Local Development Associations (LDAs). The officers and members of the LDAs are elected from among the adult male residents of each locality. Thus, the operation on the Confederation of Yemen Development Associations involves the active participation of the entire spectrum of Yemeni society, uniting both the President and the rural citizen in the same co-operative effort to implement development projects in all areas of the country at the fastest possible pace.

The Activities of CYDA

CYDA co-ordinates its activities at the national level with those of the service ministries and the Central Planning Organisation (CPO). The Committee on Foreign Relations, working in conjunction with the CPO, channels the assistance offered by foreign aid projects from other countries, as well as projects implemented through foreign donor organisations operating in Yemen, to the co-operative organisations under its auspices, and thus, directly to the development projects operating throughout the country.

Internally, CYDA co-ordinates the activities of two different types of co-operative organisations: the Local Development Associations, and the newly-organised Specialised Co-operatives. Each co-operative elects its own President, Finance Officer and General Secretary. These officers prepare all necessary official documents which are required to implement and finance development projects through the CYDA bureaucracy. Each co-operative prepares a three-year plan outlining its proposed activities, and presents an annual report on expenditures and activities. These documents, as well as all project-specific documents such as technical studies, designs and budgets are presented to the Governorate Co-ordinating Council, which in turn transfers them to CYDA for final approval. The actual development projects selected for implementation in any given year follow guidelines outlined at the national level, as well as the regional priorities defined by the Governorate Council. Thus, the CYDA bureaucracy is able to direct and oversee the work of the co-operatives operating at the local level.

The central CYDA bureaucracy also periodically organises General Conferences in which all its associated co-operatives participate. At these General Conferences the accomplishments and shortfalls of the development movement are discussed. Important decisions are made regarding the organisation of the admini-



Hajjah. A newly constructed cultural centre.

Photo: C. Little/Aga Khan Awards.

stration, the financing scheme, the diversification of development activities among the various types of co-operatives, and any other issues relevant to the work of the co-operative movement. There have been five General Conferences to date.

The CYDA central bureaucracy also oversees, in co-ordination with the Ministry of Social Affairs, all elections which are required to select representatives at the local, the district, the provincial and the national levels. These elections are held every three years.

CYDA is divided into Administrative Committees with discrete spheres of activity which also work together to oversee the work of the co-operatives and strive to guarantee that the monies expended do in fact result in tangible benefits, at a reasonable cost, to the citizens. The Committee on Planning reviews the three-year plans of each co-operative and provides technical assistance in project design and cost studies. The Planning Department prepares statistical summaries of information regarding the co-operative movement. The Committee on Culture and Information publishes, in its own and other magazines, pamphlets and articles, information regarding the co-operative movement in general, and the work of the co-operatives related to CYDA in particular. A newly-established Committee on Training aims to provide training courses at all levels, in Yemen and abroad, to benefit people working in all activities related to the co-operative movement. The Public Services Department of CYDA provides low-cost drilling, geological and hydrogeological services to the co-operatives. Working with its own equipment, the Public Services Department is hoping to standardise project designs and equipment used in implementing projects in order to reduce the cost and improve the quality of its service to the citizens.

The central administration of CYDA also undertakes many other activities aimed at the promotion of the co-operative movement from time to time. Through co-ordination between the Administrative Board and the Legal Advisor of CYDA and the Presidential Office, Republican Decisions and Laws are issued which create, modify and invigorate institutions which serve development and the co-operative movement. For example, the Co-operative Development Bank and the Agricultural Credit Bank, each independently established but later merged by Republican Decisions, offer loans to individuals and co-operatives to finance development schemes.

In addition to the foregoing, CYDA

- organises an annual tree-planting campaign;
- organises international conferences dealing with different aspects of development within Yemen, and also sends representatives from Yemen to participate in conferences abroad;
- undertook the compilation of a national census in December 1981;
- financed the establishment of a modern pottery factory in Sana'a;
- assumed an active role in assisting the earthquake relief effort, which began immediately after the occurrence on 13 December 1982 and continues to the present to assist and direct the myriad of programmes related to the rebuilding effort.

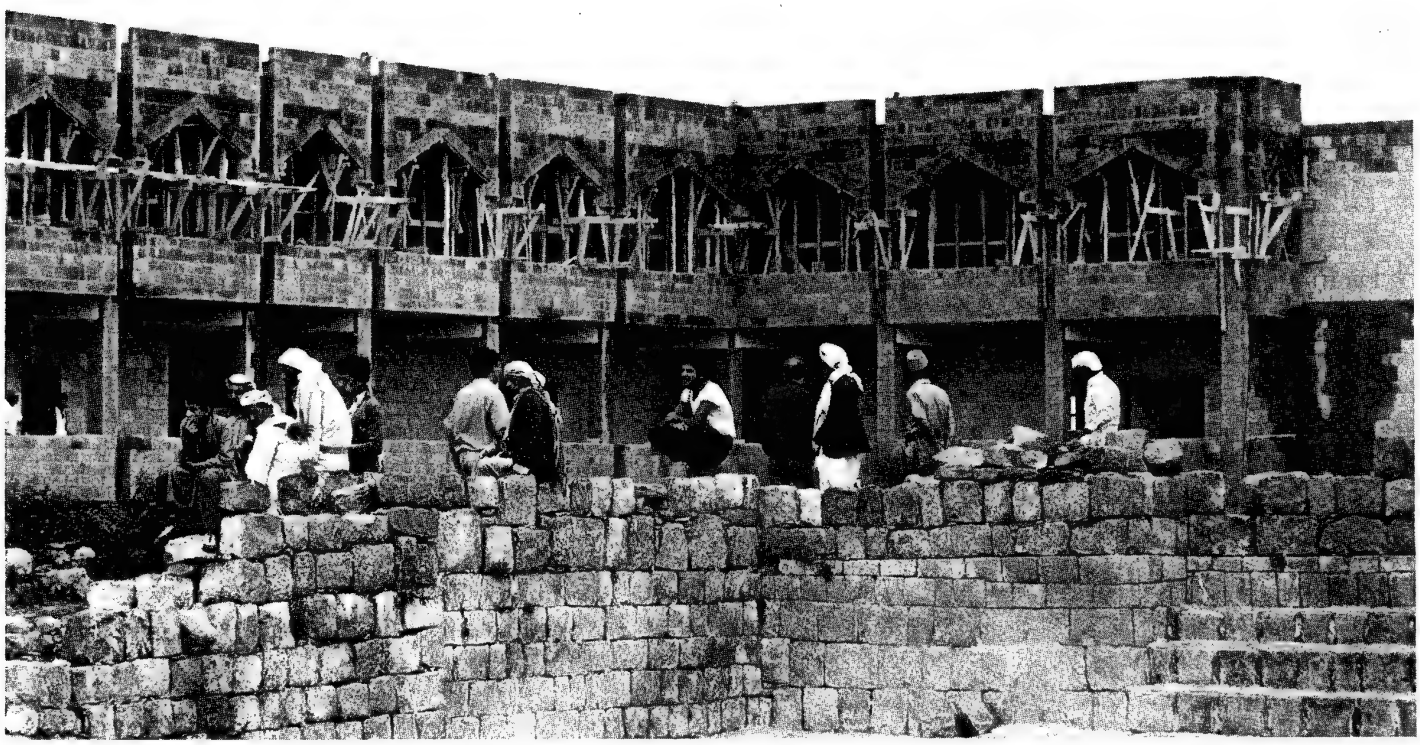
Evolution of CYDA

The confederation of Yemen Development Associations has evolved from, and in accordance with, a number of Republican Decisions, Statutes and Laws issued between the early 1960s and the present. Law No. 26 of 1963 specified how co-operative societies were to be legally constituted, incorporated the co-operatives which were already operating in the country, and laid the legal foundation for the expansion of the co-operative movement which took place over the course of the next decade. Law No. 35 of 1975 clarified the legal and administrative framework within which these co-operatives would work. This law responded to the recommendations expressed by representatives of the co-operatives who attended the First General Conference which was convened in Ta'izz in 1973 as well as the Recommendations and Decisions taken by the Second General Conference of 1974. At the Third General Conference in 1975 a series of documents prepared by CYDA (which further organised, co-ordinated and directed the work of the co-operative societies) was approved. It was at this time that the Governorate Co-ordinating Councils were established, the role of CYDA itself was defined, and the operational and financial systems governing the co-operatives were determined.

The Fourth General Conference was convened in Sana'a in 1979. It was at this conference that the establishment of the Co-operative Bank was approved. Laws further defining the role of CYDA, establishing the Co-operative Bank as well as Agricultural and Trade Co-operatives were approved. The Fourth General Conference also recommended the establishment of Fishing Co-operatives to develop this natural resource.

The Fifth General Conference was held in December, 1981. The Conference recommended the advancement of Agricultural, Trade, Fishery and Consumers' Co-operatives; and suggested that customs revenues might be used to purchase operating equipment for them. The Conference also called for the modernisation of trades and crafts. Considerable attention was devoted to the Specialised Co-operatives at the Fifth General Conference, which demonstrates their increasing importance in the work of development.

It may be seen that CYDA is a continually evolving institution which responds to the recommendations of its constituents and is shaped by Laws and Decisions passed by the government. The co-operative movement has undertaken many ventures, and been directed by many different administrative procedures over the course of the last twenty years.



Hajjah. A religious institute under construction.

Photo: C. Little/Aga Khan Awards.

Whereas not all of the policies and procedures thus adopted have been successful, the institution has proven flexible enough to change and modify itself according to the needs of the citizens and the changing conditions of society. Within the last few years the national headquarters of CYDA has been constructed in Sana'a, and governorate as well as some district-level meeting halls have been constructed all over the country. The experience gained over the last two decades has informed the evolution of present structures and policies. The activities of CYDA are expanding, and the institution has evolved to keep pace with the ever-higher level of activity. As the administrative systems become further and more clearly defined, CYDA looks forward to a stage of better-planned and co-ordinated activity in the future.

The CYDA has played a major role in initiating, co-ordinating and directing the activities of the co-operative movement in the Yemen Arab Republic over the last two decades. CYDA's performance in combining local initiative, regional co-operation and national planning has guaranteed the continuity of the organisation as a viable institution of government. As an embodiment of the Republican government's commitment to development as a means of raising the standard of living of citizens in all parts of Yemen, CYDA's activities and achievements have promoted the legitimacy of that government, and provided an occasion for the development of democratic institutions throughout the country.

The Work of the Co-operatives

The Local Development Associations are legally-constituted popular councils organised at the district level. Each LDA receives an annual budget from CYDA to cover operating expenses and to finance the development projects which it undertakes. The national financing scheme provides that 75 per cent of the annual tax revenues collected in the district be placed in the budget of the LDA. In addition to this, a small percentage of the total central government's annual budget is divided among the co-operatives to increase their revenues. Thus, the establishment of an LDA in a given district insures the return of lost money paid by its residents in *zakat*, as well as providing an opportunity for its citizens to obtain extra funds from the national budget or

from foreign assistance programmes. This system encourages the active and productive co-operation of citizens in all parts of the country with the Republican government, and provides the government with a means of assisting the citizens in the work of development which is among the highest national priorities.

The work of the LDAs is devoted to the implementation of basic infra-structure projects of four major kinds: roads, water-supply systems, health facilities and schools. Over the course of the last two decades, various financing schemes and many different kinds of projects have characterised the work of the LDAs. The experience acquired during this period has led to the present focus on infra-structure, according to the financing scheme outlined above. It has been seen that the operating budgets of the LDAs are not sufficient to cover the cost of providing all basic services to all citizens immediately. Whereas it had been anticipated that subsidiary revenues could be provided by dividing the cost in equal thirds among the local residents, the LDA and the relevant government agency (e.g., the Ministry of Health or the Ministry of Education), long bureaucratic delays and frequent defaulting on the part of the relevant government agency has led to the abandonment of this cost-sharing scheme.

Specialised Co-operatives: Beginning from the time of the Fourth General Conference in 1979, CYDA has promoted the establishment of co-operatives devoted to specialised fields of endeavour such as agriculture, fishery, handicrafts, etc. Consumers' unions and housing co-operatives are also being created under the rubric of Specialised Co-operatives, and the structure is broad enough to permit the establishment of any type of co-operatives which could benefit the country. Between 1979 and the present more than fifty Specialised Co-operatives have been established, and although they are administered by a separate committee of CYDA, these co-operatives are subject to the same organisational structure and follow the same procedures as the LDAs. One major difference between the LDAs and the Specialised Co-operatives is that the latter, up to the present time, have not been provided with budgets emanating from tax revenues or other central government resources. The financing of all activities undertaken by the Specialised Co-operatives to date has been achieved through contributions of the members of each individual co-operative. The official establishment and registration of each new Specialised Co-operative provides the means whereby CYDA can furnish administrative and technical assistance, training and any financing available from private or foreign donors.

The activities of the Specialised Co-operatives are devoted to increasing production, modernising traditional crafts, developing new industries and establishing marketing systems to distribute locally-produced goods. Through these co-operatives it is envisioned that income-generating projects may be undertaken which can provide additional sources of revenue for development works. The establishment of Specialised Co-operatives marks a new stage in the evolution of CYDA, representing an expansion of activities beyond the original concentration on infra-structure projects and basic services.

Achievements of the Co-operative Movement

The implementation, through CYDA, of thousands of development projects in all parts of the Yemen Arab Republic has changed the shape and structure of society. The provision of basic services such as roads, water-supply systems, health facilities, schools and other services has made a tangible improvement in the quality of life of citizens even in the most remote reaches of the Republic. The new roads, built or improved through planned LDA activities, permit access for the rural population to the goods and services of the modern world which have dramatically transformed their daily lives. The new and the improved water supply systems are promoting a higher standard of health and hygiene, as well as providing a modicum of leisure. Modern health facilities are reducing the impact of disease and injury, while preventive programmes operating through the expanded medical establishment aim to control and eliminate many medical problems in the future. The newly-constructed schools are preparing a new generation of citizens to run a modern society. The provision of basic services has helped to encourage thousands of Yemenis to remain in the rural areas and to continue to develop the agricultural work which has been the pride of the nation throughout the centuries.

The experience of working through the co-operative movement to provide basic services has led to the establishment of a nation-wide institutional structure which is capable of co-ordinating the requirements and designs of local, district, provincial and national authorities. That same institutional structure can now be employed to expand the range of co-operative activities. As the agricultural, trade and consumer co-operatives evolve, a greater emphasis is likely to be placed on improving production and the marketing of locally-produced goods. CYDA has been successful in establishing the foundation for co-operative development work in Yemen. One may hope that this work will continue to evolve and expand, in order to improve the standard of living and the quality of life of people in every quarter of the nation.

The Co-operative Framework for Local Development in Hajjah and Hodeidah Governorates

Sheila Carapico

The following are excerpts from a study based on research carried out in the Yemen Arab Republic in 1978 and 1979. The author, a doctoral candidate in the Department of Political Science, State University of New York, Binghamton, U.S.A., has written this study in collaboration with CYDA and has kindly allowed AKAA to publish portions thereof.

Introduction

The first thing that should be said about the Yemeni co-operative movement is that its accomplishments, over scarcely a decade of operation and barely three years of operating under a formal constitution, are truly remarkable. The local development co-operatives have organised construction of thousands of kilometres of rural roads and many hundreds of potable water projects and primary schools serving rural communities, and participated in dozens of health facilities, youth clubs, electrification schemes and afforestation projects in the urban and the semi-rural areas. They have, moreover, become a force to be reckoned with in both local and national affairs. One anthropologist has stated that "if one were to write an inter-actionist ethnography of a single Yemeni town, it would be the *ta'awun* around which everything revolved".

The movement began with the demand by a few activists, mostly in towns, for the release of local tax monies for utilisation in local development projects. Such efforts, tentative at first, were in many instances combined with pre-existing welfare associations which maintained a small fund for poor relief and mosque repair. The Republican government, in 1963, hastened to recognise these local welfare co-operatives. Efforts to obtain financing for local development initiatives redoubled, and in 1973 a national union for development co-operatives was formed. This union, or confederation, has become a highly visible department of the Ministry of Social Affairs, Youth and Labour, wielding considerable influence in local co-operative affairs. Despite the rapid expansion of co-operative institutions, however, the local development associations are still very much in their formative stage. The Arabic word *ta'awun*, which is used much more frequently than the official titles, "Local Development Co-operative" and "Local Development Board", literally means co-operative, co-operation, or mutual assistance. The word *ahli* translates as local, domestic, or familial and is more strongly emotive than some other words also meaning "local". Similarly the word *tutwir* means development in the sense of the evolution or enhancement of existing potential, as opposed to *tanmiyyah*, which means development in the sense of growth or expansion. The Arabic name *ta'awun al-ahli lil-tutwir*, literally "local co-operative for development", thus implies affiliational co-operative efforts for self-development in a way that the bland institutional translation "LDA" does not. If in actuality the board of the local association consists of two or several locally respected individuals rather than a duly constituted representative committee of seven members, but those individuals honour the public trust and get projects built, then everyone is satisfied. The formal institutional organisations and regulations, only recently legislated at the central level, have not yet become routine operations locally; folk organisation is still the predominant *modus operandi* at the local level.

Nor is this in contravention of state or CYDA policies regarding local co-operatives: the LDAs are regarded officially as independent local associations, not official state institutions. A "co-operative may be established which does not spring from the official direction or a state imperative, to the extent that its basis is the awakening of the people themselves, in every region, to establish co-operatives." CYDA, headquartered in Sana'a, was created to help in securing central sources of financial and technical support to local development efforts, but both the ideology and the electoral system of the LDA-CYDA organisation confirm that the legitimacy of the entire structure rests with the social community.

Emergence of a National Structure

The new Republican government, when it was formally established on the 26 September 1962, was in no position to finance or execute reforms or improvements which the republican ideals encouraged citizens to expect, but wanted to encourage the development of self-help initiatives. For this reason, Ordinance No. 11 was passed in 1963 to encourage the formation of local co-operatives. The ordinance legalised local welfare associations and provided a rough outline for their organisation, but gave them no real legal or administrative status.

Also among the early reforms introduced by the republican government was an elimination of the coercive force used by the tax collectors. Payment of the *zakat* was made voluntary; that is, citizens were to pay according to their consciences, in keeping with personal religious beliefs. This, it seems, opened up several possibilities to the tax-payer: to pay the conscience-bound 10 per cent of the local tax collector, trusting him to forward it to the central government treasury; to distribute an equivalent amount personally to the ill, destitute, or bereaved in the form of charity; to deposit the *zakat* with a sheikh, or alternatively in a local welfare society for distribution as charity; to contribute directly to community service projects, hence to the local development association; or to renege the religious responsibility. These two legal reforms paved the way for the organisation of local development associations.

Institutionalisation of a nation-wide co-operative structure began in earnest after the end of the civil war when the national government turned its full attention to the tasks of reconstruction and develop-

ment, and representatives of individual co-operatives began to meet in small groups to discuss common problems and objectives and the possibility of forming a national union. As a result of these initial discussions, the leaders of eleven governorates and of local development associations met with representatives of the Department of Social Welfare and the Central Planning Organisation on 24 March 1973 to sign an agreement to establish the General Union of Local Development Co-operatives. Three months later, in June, a co-operative conference was held in Sana'a and was attended by representatives of twenty-eight co-operative associations. There were other associations at that time which declined to attend. The conference was successful in that it established a forum for national co-ordination and discussion and publicised the aims of the co-operative movement. Seventy co-operatives were represented at the national conference of November 1974, at which was formally established a general programme and organisation for the General Union of Co-operatives. This programme was presented to the Ministry of Social Affairs, Labour and Youth. In November 1975, following a conference at which 130 LDAs were represented, the boards of the local development associations were legally authorised to carry out service projects in the economic, social, cultural, agricultural and health fields. Law No. 35 outlined the basic organisational structure of the boards of the local development co-operatives (LDB), of the Co-ordinating Councils in each governorate and of CYDA, and authorised the LDBs to receive one-half of the local tax (*zakat*), a quarter of the municipalities tax, an additional 10 per cent of the *zakat* on vegetables and fruits, foreign aid monies designated through CYDA, and various other local incomes.

This law provided a basis to organise elections according to the framework sketched in Table 1. The first official elections were held in 1976 at the district (*nahiyah*) level for the general assemblies and administrative boards of the LDCs, and Co-ordinating Councils were set up under the chairmanship of the governors to provide a liaison between the local boards and the central offices of the movement under the Ministry of Social Affairs. The 1976 national conference, under the slogan "Co-operation for a Unified Muslim Yemen" was the first to hold representative elections for the Administrative Board of CYDA thereby legitimating its authority to establish policy for the local co-operatives. The conference also passed resolutions favouring the development of agricultural, vocational and housing co-operatives, and the refinement of CYDA's organisational laws and the LDAs' planning and budgetary procedures.

Table 1 **Formal Structure of the Development Co-operative Organisation**

Admin. Unit	Organisation	Membership	Officers
Nation	CYDA Administrative Committee	11 Secs-Gen of CCs 11 elected from General Conference 6 Deputy Ministers Chairman, Co-op. Bank Chairman, CFO Pres, Elect. Corp. Pres, Social Affairs Administration Sec-Gen, Migrants Union	President Sec-General Ass't Sec-Gen 6 Committee Chairmen: • Financial • Foreign Affs. • Culture and Information • LDAs • Planning • Co-ops and Forestation
	General Conference	Pres, Sec-Gen and one other member of each LDA	(elect Admin. Committee of CYDA)
Governorate	Co-ordinating Council	President of each LDA and the governor	Sec-General Ass't Sec-Gen Financial Officer
District	Admin. Board of the Local Development Assoc. (LDB)	7 members for rural boards; 9 members for town boards	President Sec-General Financial Officer
	General Assembly	One representative for each 300–500 residents	(elect Admin: Board of LDA)
Village or 'Uzlah	Village or 'Uzlah Development Co-operative Committee	One member of the General Assembly and 4 other elected persons	Chairman

Development Co-operatives in Hajjah and Hodeidah

As elsewhere, the first co-operative associations in Hajjah and Hodeidah governorates were community welfare organisations formed without any guidance or interference from the central government or its duly constituted authorities. One of the earliest and best known experiments was the Hodeidah city co-operative, which was formed in 1954 following a fire that destroyed a major thatch-hut portion of the city. Called the Local Co-operative Board, this association developed written plans for a fire-fighting squad, garbage and sewerage removal, drainage of malaria-breeding water and the like. The association persisted despite the Imam's attempt to suppress its activities. A few years later, a locally initiated municipal association was operating in the village of Jerahi (Zabid district). Documentation is scarce, but similar organisations probably existed in other towns of the Tihama as well. In 1962 a fishermen's co-operative was founded in Hodeidah to improve production and marketing.

Hajjah. The improved roads and a new construction industry have brought rapid change to the town. Photo: C. Little/Aga Khan Awards.

During the civil war, and following the 1963 Co-operative Law, a few communities founded welfare associations. Those in the Hajjah highland responded to the destruction and need for relief caused by the civil war. These welfare associations utilised citizens' contributions to repair cisterns and mosques, and to assist the families of men killed in the fighting, but the attention of those who might, under ordinary circumstances, have devoted their energies to co-operative or developmental efforts, was focused on the war itself. Serious efforts to develop the rural and semi-rural infra-structure in the name of the co-operatives began in the early 1970s, only after peace was established.

Formal organisational development co-operatives began under the leadership of strong governors in both Hodeidah and Haajjah. Governorate-level LDBs were organised under the chairmanship of the governors, and both Boards began immediately to encourage the formation of complementary organisations at the *qada* level, the lowest level of the Imamic administration. Local requests to the governor's office or the central government to the co-operative board office in each *qada*. A portion of the *zakat* and other revenues were to be made available to the *qada* boards to finance these projects, and an attempt would be made to locate matching funds from outside to defray part of the costs.

By 1974 Co-operative Development Boards existed in both governorates, and local offices were established in most of the *qada* centres to co-ordinate development projects. Plans were drawn up and priorities established at the governorate level in consultation with the leadership, which then assumed responsibility for overseeing the implementation.

During this period, the towns of Hajjah and Hodeidah, as governorate capitals, enjoyed special access to national infrastructure-building funds; in the early 1970s the governors, as leaders of the provincial co-operatives, marshalled local and national capital for town projects such as water systems, streets, schools and hospitals, municipal afforestation and parks. The Hodeidah city LDA even arranged the construction of solid-materials workers' housing as part of the campaign to prevent fires among the thatch huts. The Hajjah co-operative arranged construction of a technically sophisticated water-supply system for the town which pumps water from a perennial wadi 4,000 m below and distributes it to neighbourhood tanks in the town.

Plans tended to vastly over-estimate the financing and implementing capacity of the local boards. In 1974 the Hajjah development co-operative in conjunction with the governor's office, published a pamphlet entitled "Miracle on Hajjah

Mountain", which outlined a detailed plan including more than fifty separate projects (32 of them schools) in the five *qada*s of Hajjah province and roads connecting Hajjah town to both Hodeidah and Sana'a and to the principal regions of the governorate. Budgetary considerations were mentioned only in the context of the need to increase revenues, but it was proposed that for the Hodeidah-Hajjah road, which was top priority, the government would pay one million riyals, and the two governorates would contribute half a million riyals each. The Hajjah-Hodeidah connection was completed by 1976, but the Hajjah-Sana'a route (via Amran) was still under construction in autumn 1979, and many of the secondary roads and other projects have yet to be undertaken.

Sources of Variability

As is the case with *nahiya* development co-operatives today, the *qada* associations varied in their levels of activity, but tended to focus their first efforts on projects serving the administrative centre. One of the most active *qada* boards, organised in Zabid in 1969, began implementing service projects in a four-*nahiya* area in 1974. By the time of the 1976 elections, which established boards in each *nahiya*, the *qada* Zabid co-operative had accomplished about a dozen projects (schools and clinics) about half of them serving the *nahiya* Zabid. The co-operative associations of the *qada* Sherrifean planned roads to connect all eight *nahiya*s to the *qada* centre of Mahabashah, a small town which prospered as the hub of a local road network.

When the LDBs were established at the *nahiya* level, *qada* associations had already provided at least some basic services to the *qada* centre. The new *nahiya* IDAs which included a former *qada* centre were consequently in a better position to work on rural service projects than the outlying *nahiya* co-operatives, many of which literally started from scratch in 1976. Among the problems faced by new co-operative boards were the lack of basic infra-structure in the area, popular ignorance of the objectives and organisation on the development co-operatives, unfamiliarity with electoral procedures, and the absence of channels to direct local revenues into the co-operative budget.

LDAs in various governorates are, therefore, at different stages of development. Some (especially in the more urban communities) have been in operation for over a decade, and have established local procedures, revenue lines and faith in the co-operative's ability to provide services. Others, more recently established, lack guaranteed revenue sources and are unsure of how to proceed.

Other factors, not strictly historical, also have varying influences on the development co-operatives. The most obvious of these is financial resources. The development co-operatives' budgets are derived from an increasing range of central, local and individual sources. The following come from local services: 75 per cent of the *zakat*, 25 per cent of local municipalities tax, citizens membership fees; local gifts and contributions; taxes on internal transport, cinema taxes, and rental of LDA equipment and services. Central sources contribute through share of foreign aids to CYDA, share of institutional state aid to CYDA, 2 per cent share of co-operative customs tax, and 10 per cent share of national grain and vegetable *zakat*. In addition to which there are contributions from citizens and government, government contributions, specific foreign donor projects, and loans from the Co-operative Credit Bank.

Data showing the relative contribution of these various sources to particular LDA budgets is difficult to obtain, but it is obvious that the range is considerable. Nidi *nahiya*, for example, is relatively poor in agricultural production but lies on an important Yemeni-Saudi trade route and probably generates a relatively high revenue from internal transport taxes. The town's hospital, water project, school, youth club and planned electricity project have all been central government or Saudi gifts. Some districts, especially rural ones, collect no municipalities, cinema or internal transport taxes or rental fees, but the Zabid LDA records receipts from all four.

The *zakat* is generally considered to be the main source of LDA funding, or at least the source which offers the greatest potential for financing locally initiated projects. Utilisation of the *zakat* for public services is considered to be a worthy application of the religious principle from which it springs and is hoped that budgeting *zakat* to local co-operatives would encourage voluntary payment. It is also expected that LDAs will seek to improve agriculture as a means to improving their financial situation, and that peasants' trust in the co-operative effort will increase as they see their *zakat* being returned to them in the form of service projects.

Nation-wide, however, it has been reported that a large amount of the *zakat* was either not paid or never recorded in the central treasury: for 1973 only eight per cent of the anticipated revenue was forwarded to the treasury, and for 1974 scarcely three per cent. For the period 1970-75, the estimated deficit in *zakat*, 1,000 million riyals, was approximately equal to what the YAR government borrowed internationally.

How much of this deficit was caused by non-payment and how much by corruption of officials is not known, but it seems that some strongly federalist committees collected the *zakat* locally but refused to forward it to the central treasury out of an historically-rooted fear that it would not be returned to them. Thus part of the deficit, though not recorded in Sana'a, might have gone towards LDC projects as direct citizen contributions to a worthy local cause. As a production-based tax, the legal *zakat* also varies from one *nahiya* to the next as

a function of agricultural production — one member of the Hajjah Co-ordinating Council estimated that the *zakat*-based revenues to LDAs in the governorate range from 20,000 riyals to over 2 million riyals annually.

LDAs also differ from one another with respect to interest and priorities, partially as a function of geography and ecology. Beni Awam *nahiya* (in the mountains of southern Hajjah) spent its entire *zakat* for 1977-78 on a road to the *nahiya* centre; whereas the first major project for Luhiyyah (on the Red Sea Coast) was a potable water system for the town and the neighbouring village of Khobah. There are also historical and cultural values operating in the project selection process. A good example of this is Zabid, which has long been a centre of scholarship in Yemen and whose LDA has constructed five schools, including a girls' school and a religious institute. But there is also an intangible variable: for example the Zabid *nahiya*, for all its LDAs activities and projects, has no agricultural or other productive society, whereas the neighbouring *nahiya* of Jarahimy has four agricultural societies but not even the basic services in the *nahiya* centre.

The high degree of variance in LDA accomplishments, revenues and priorities makes it virtually impossible for CYDA, or even the Co-ordinating Councils, to formulate plans, procedures and policies which take just account of the needs and capabilities of all local development associations. Similarly, each locality is convinced of its uniqueness, and often of the incapability of "outsiders" to understand their problems and solutions. Thus the fierce federalism of the Imamic Yemen persists in the form of a strong ethic of local self-goverment and control of local resources.

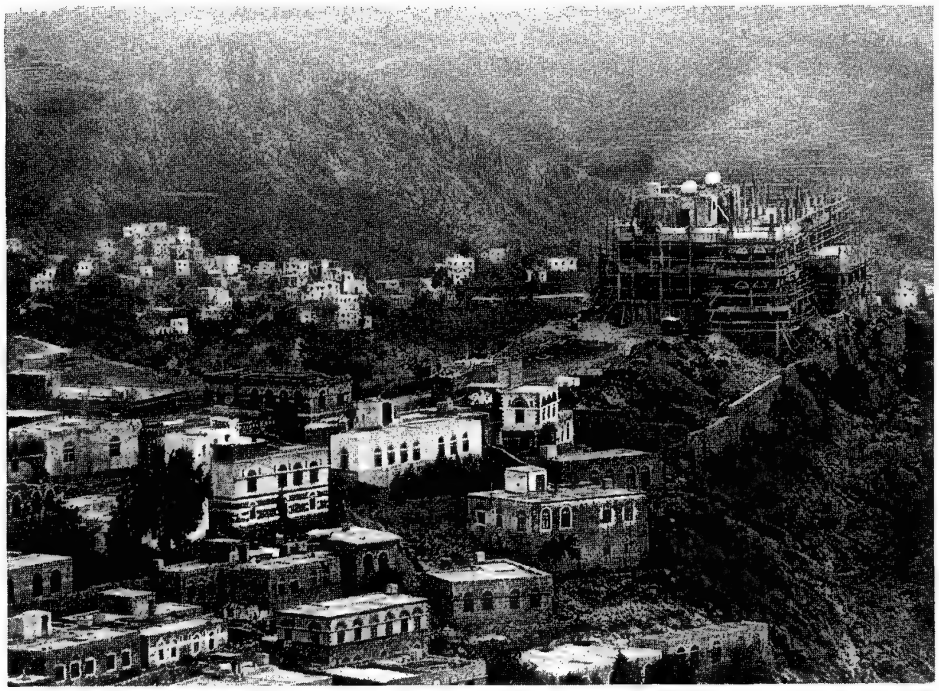
Project Planning and Financing

In 1976 LDAs were officially constituted in each *nahiya* in Hajjah and Hodeidah governorates. For some regions this meant a division of the *qada* association into their constituent parts at the *nahiya* level; in others, this was the first time that a formal co-operative organisation was attempted. A majority of LDA members was designated to an entirely new position by an unfamiliar electoral system and were entirely unacquainted with formal book-keeping and administration. They quickly became responsible for managing the public funds and development projects for a sometimes varied and scattered population, and for setting up some basic budgetary, routine office and communications procedures. A great deal depended on the interest and integrity of these individuals, for there was no real process of accountability from either above or below, beyond that of social reputation.

Regardless of when they were established, the majority of development co-operative was founded on a single project effort, usually a road to the *nahiya* centre in the mountains, or a water project for a town in the Tihama. Often this project (and perhaps one or two, including a school after it) was such a clear priority that it justified expenditure of all available resources for a year or more (such as the Luhiyyah-Khobah water project and the Beni-al-Awam road). One such project per year might be accomplished without the need for much planning for paperwork; it is only if and when the *Ta'awan* has become established as a services-providing institution in the area that the need for planning and budgeting arises.

The formula for distribution of financial responsibility represented an attempt by CYDA in 1977-78, along with the Unified Accounting System, to rationalise the system of central funds allocation and assure their more even distribution. The same year, the share of local *zakat* budgeted for local co-operatives was raised to 75 per cent. Overall, the main financial burden rests with the beneficiaries, but for each case (except very short feeder roads), the government pledges its own and LDA matching funds. This formalisation of proportional responsibility was intended to help the development boards in writing up plans and estimating more precisely the cost to the LDA budget for any given project proposal. The written plan should follow the format provided by the Unified Accounting System. It utilises a basic and simplified accounting method which itemises anticipated incomes and expenditures — the total for which, according to the format, should be equal. The plan is written up by the Administrative Committee of the LDA and then, according to the rules ratified by the General Assembly, which meets once a year. The ratified plan is then forwarded by the president of the development co-operative to the Co-ordinating Council, which incorporates it into a master plan for the governorate. When CYDA receives the governorate plans, it formulates its own national plan and notifies the appropriate ministry or authority of its expected contributions.

The governor, through his control of road-building or well-drilling equipment by the CC and its hired engineers and technical staff (still very limited), and CYDA, by virtue of its access to national and international resources, do exercise influence over the boards through the dispersion of funds and technical assistance. But neither has the power to direct the LDBs in the use of non-central incomes; nor, indeed, can they either actually require the submission of plans and budgets, or insist that the LDB use them for development projects. Only LDBs with an especially educated and sophisticated leadership or hired professional accountants (that is, only very few of them) probably submit detailed budgets such as outlined by CYDA. Even when a written plan exists, the arena for plan formulation is such that inclusion of a given community's priorities generally relies on informal communication channels within the *nahiya*. No clear criteria exist to insure inclusiveness or to assign priorities among project proposals. Consequently the plan for a given *nahiya*



Hajjah. The building under construction intentionally follows the traditional style.

Photo: C. Little/Aga Khan Awards.

might include a road to the major sheikh's house, or a water system for the town, and nothing else; at the other extreme, it might list a paved road, house-to-house water delivery system, schools through the secondary level and clinic with X-ray facilities for every community of 500 persons.

Planning for the Localities

The weakest point in the formal system is still the crucial linkage between the LDB and the various communities in the *nahiya*. It is recognised that "the board itself lacks the capacity to pursue every project and comprehend all the popular undertakings of the individual areas, due to its limited membership in some districts and lack of membership in other districts..." and "the inability of the members to follow up all the requests in villages and rural areas" (al-A'awoudi). In principle, therefore, the real legitimate authority to collect funds and to initiate projects rests not with the board but with the directly-elected general assemblies and the village co-operative and development committees. In practice, however, neither of these bodies is actually constituted or active on my continuing basis. Although individual members of the General Assemblies may be active and/or influential in co-operative affairs, the assembly itself is little more than an electoral college which meets in election years to vote for the administrative committee and then retires. The village co-operative and development committees are typically *ad hoc* associations which form around a particular project initiative, usually with great enthusiasm, often at a *qat*-chewing session. But they dissolve just as quickly once the project gets going. The effort may be spearheaded by the sheikh, who, in the traditional order of things, is expected to lead the community, or by visiting migrants, who spend a few months vacation in the village and get things going. Potential investors often lobby for electrification schemes and especially roads. The activities of sheiks, 'amils, amins and other local notables are so often mixed with the activities of the LDAs that several foreign observers have mistakenly assumed these roles to be part of the official co-operative framework.

Methods of contribution vary with the community and with the type of project. Where tribal loyalties are invoked, each armed man may be required to contribute an equal amount, but the non-tribal or "protected people" not asked to pay at all. For some school and water projects where it is felt that every citizen benefits equally, a contribution "per head" may be required. Roads may be financed the same way, but there are instances of relatively small groups, who expect direct commercial benefit, raising the entire share themselves. Some communities collect on an "ability-to-pay" basis, either leaving the amount to individual conscience, or relating the amount to be paid to the amount daily or weekly spent on *qat*.

If the funds-raiser has sufficient political authority, he may personally assess each person's ability to pay. In any event, those exempt from the *zakat* are not pressed to pay. (The Koran states quite clearly that the poor are not required to pay the *zakat*.) Most beneficiary contributions seem to be raised immediately after the Friday noon prayer and sermon, or at the Friday *qat suq* (both of which are gatherings of the male community) by someone with experience in handling public funds.

In the case of school and water projects serving small communities, the problem is that the LDA can scarcely keep up with local initiatives. Each village wants its own school and its own potable water supply, and most expect the LDA to con-

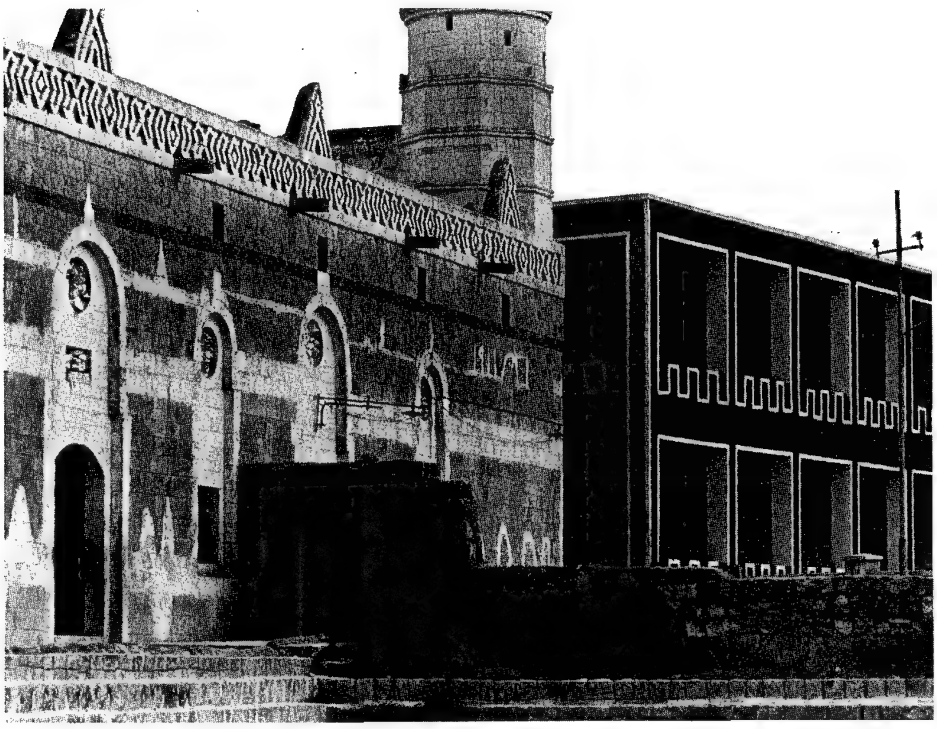
tribute funds in keeping with the officially posted distribution of financial responsibility. In fact, however, few active LDAs control sufficient financial or technical resources to meet all local petitions for matching funds (al-A'awoudi). The following example perhaps illustrates this point.

The village of Nisrafah consists of scattered hamlets in the area of Wadi Hayran, in southern Nidi *nahiya*. There are no elected LDA representatives from the village, but a water project, a school and a mosque are all currently under construction in the name of a local co-operative effort led by a paternalistic sheikh. The village water supply comes from the sheikh's well, and is piped to the hamlets. The well is a bit shallow, however, and it has become necessary to operate the pump for an half hour and then let it rest for a full hour while the water replenishes. In response to this problem, the sheikh has determined to build a water storage tank to facilitate regular delivery to the hamlets. He has personally donated 20,000 riyals and elicited a pledge of 5,000 riyals from the LDB, and is now looking for a contractor (neither the engineering nor the building skills being available locally). If the project costs more than 25,000 riyals, then beneficiary contributions will be solicited.

The school is being planned locally in accordance with the CYDA formula. YR 10,000 were collected from the citizens at the rate of YR 200 per person. The LDA is expected to contribute YR 10,000 and the Ministry of Education, YR 10,000, plus teachers for the first and second grades of primary school. Salary supplements to keep the teachers in the village would also, presumably, be supplied from LDA funds. Everyone was quite certain that these funds would be forthcoming. The sheikh added, with pride, that fifteen schools were being constructed according to the formula in the Wadi Hayran area each costing YR 30,000. If each of these communities is also asking for YR 5,000 towards a water-supply project, then the demands on the LDA budget from a small geographical area of the *nahiya* would total YR 225,000. Exact figures are not available, but this is likely to be a large portion if not all of the total operating budget of the LDA and beyond the resources of the Ministry of Education to provide matching funds and teachers as well.

Nor unfortunately, is this an isolated example. Some communities, in fact, have had the bitter experience of initiating a project, only to be informed later that LDA funds are not available, or that it is too late for their project to be included in the plan and thus become eligible for direct financing. In such a case the community may lose faith in the LDBs ability or interest to meet local needs. There may be allegations of unresponsiveness, of corruption or of favouritism towards certain communities. Any of these may be true in certain instances, but they should none the less be viewed in the context of budgetary constraints and a still unrefined, and not widely understood, planning process.

In the water sector a new approach is being tried in response to the financing problem, especially for villages and small settlements: a fee is charged for delivery and the profits are returned to the LDA budget. The Turaybah water project in the *nahiya* Zabid, was initiated by an LDB member from the village, in response to the rising cost of manual water-drawing. (Originally everyone drew his own water, using a rope and pulley, but in the past decade "with the rise in wage employment" the job fell to one wellsman, who charged the others a feel for his services. By the time the villagers decided to buy a pump, each house was paying him



Hajjah. An old mosque and a new school.

Photo: C. Little/Aga Khan Awards.

150 riyals per month to draw water.) The system, built with local contributions and LDA funds, consists of a pump and motor, neighbourhood tanks, and house-to-house pipe connection. A fee of YR 25 per month per house is charged for water delivery. After expenses, these fees plus a small tax on the system contributed approximately YR 63,000 to the LDAs budget in 1977-78. The attempt to run co-operatively built basic service projects on a profit-generating basis is a slight departure from the original ideology of the movement. High fees charged in the private sector for water delivery systems serving some villages in the Zabid area were part of the impetus for the change; the other part was the inability of the LDA to finance rural water projects from their fixed funds.

Conclusions

During the period 1976-79, the development co-operatives movement expanded along several dimensions. Co-operative boards were established in every region of the country. Existing boards continued to provide public services, especially in the towns and central villages but in some of the rural areas as well. Seventeen agricultural co-operatives were founded and began working with loans from the Agricultural Credit Bank. The role of the Co-ordinating Councils, and their linkage to the constituent development boards, was developed. CYDA itself expanded tremendously, built an impressive new office building, acquired more staff and more institutional support, and published many dozens of reports and studies. A great deal of road-building and well-digging equipment was acquired.

In many ways, perhaps it has grown too fast. Certainly, the local demands to the LDBs and the LDBs' demands to the central government far surpasses the technical and financial capacity of those organs to respond. CYDA itself, the CCs, and particularly the local boards and the agricultural co-operatives are all painfully short of office and technical staff and even ordinary labour. This causes not only poor planning and even worse maintenance, but forced reliance on the over-priced private sector for transport, construction contracts, equipment rental and the like. Skilled people are all the harder to attract because private sector wages are two or three times higher than what the government or the co-operatives pay.

Of course, the neediest areas generate very little tax, especially the dry midlands, where population densities are relatively low and cost-beneficiary ratios concomitantly high. The poorest agricultural regions are also less likely to produce effective leadership than the towns and administrative centres, where the wealthy and educated have always chosen to live. Even in the most productive areas, there is a limit to the financing capacity of the *zakat*. Moreover, some observers feel that the mere legacy of pre-revolutionary corruption renders the *zakat* not a viable basis for LDA finances.

None the less, it is desirable from the point of view of local autonomy to maintain local sources of income. One of the current proposals is to organise LDA financing more along the lines of the agricultural co-operatives. A Co-operative Credit Bank was established during the January 1979 general conference in Sana'a. Its purpose will be to grant credits for development programmes, using criteria similar to those of the Agricultural Credit Bank (that is, according to the economic feasibility of the project and the likelihood of repayment). The development co-operatives will be encouraged to invest in income-generating projects. Among the many ideas now under discussion or experimentation are

- the acquisition of construction or drilling equipment or transport vehicles for rental;
- the operation or water supply systems for profit;
- partnership in a handicraft co-operative for light industry; and
- the operation of hotels.

Some private investors have voiced objections to competition from co-operatives in these ventures. Although the emerging co-operative bureaucracy was formulated mainly in Sana'a, the basic and oft-repeated cornerstone of the co-operative movement is local autonomy and self-reliance. There are fears on both sides that this is being lost. One side claims that the local contractors are becoming far too dependent on government hand-outs and that the original self-help spirit is disappearing. The federalists maintain that CYDA and the central government are interfering too much in local matters they do not fully understand. The issue of central state involvement in local affairs remains delicate. It is, moreover, exacerbated by the rather critical planning difficulties illustrated in the example given above, to which the only reasonable solution seems to be much tighter co-ordination among autonomous local planning bodies.

Urbanisation and Construction in the Arabian Peninsula

Jim Antoniou

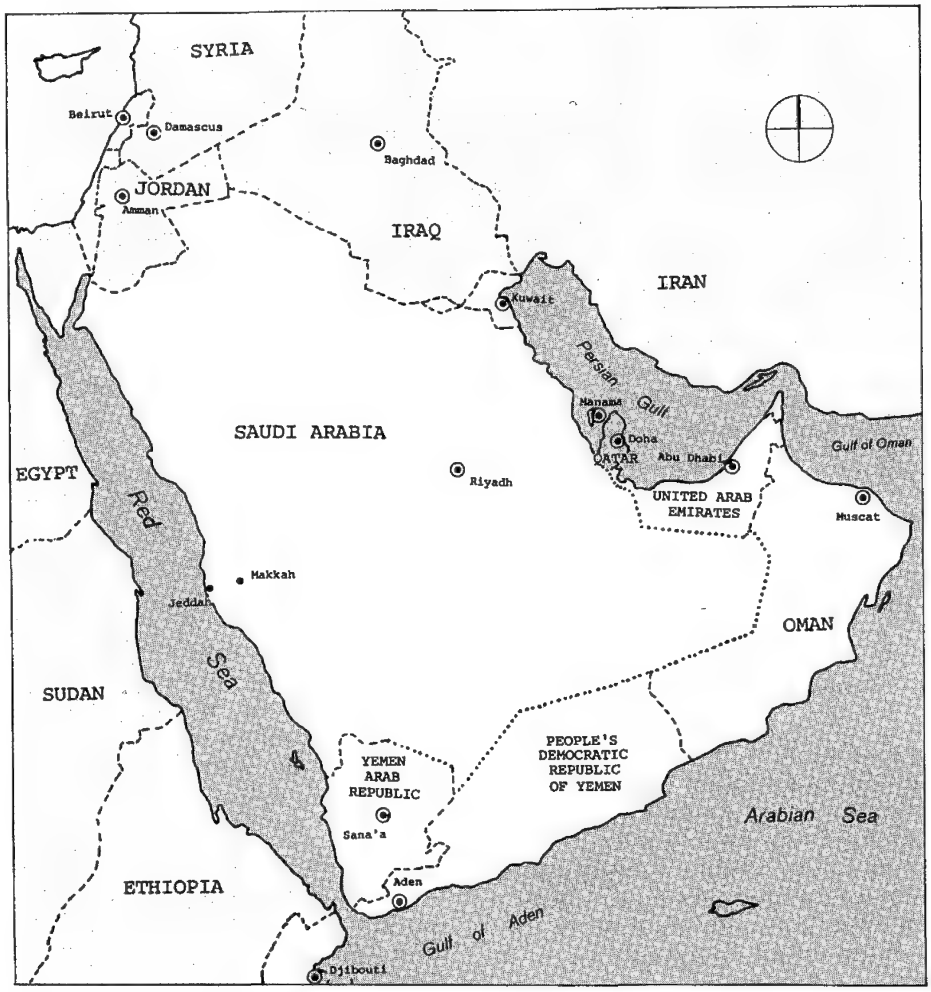
The following comprehensive survey contains essential information on the region as a whole and is instrumental for placing the Yemen Arab Republic in the geographical, economic and demographic context of the area. Portions of this survey have been excluded to avoid repetition of the information provided in other studies published in this volume.

Urbanisation and Development

With the rapid pace of development and increasing population growth, urbanisation has become the principal factor affecting the pattern of settlements throughout the Arab world.

The rate of urbanisation is having a tremendous impact on the fabric of traditional cities. Many existing towns and cities are undergoing dramatic reconstruction to deal with outdated engineering infra-structure, such as water distribution, sewerage and drainage facilities, and traffic patterns.

In new settlements, too, with the development of new infra-structure and physical plants the living patterns of the inhabitants are likely to change. The problems encountered in many cities are typical of the region where people from rural areas flock to the main urban agglomeration searching for work and better living standards.



Map of the Arabian Peninsula.
Source: AKAA.

Patterns of Development

Development plans in the region are likely to vary substantially from one country to another, but they nevertheless follow several broad patterns. One pattern is typical of those states with small populations and limited area of land. A second pattern predominates in Saudi Arabia with only a small indigenous population, but with vast areas of land.

Another determinant of development patterns is financial resources. Countries such as Saudi Arabia and the Gulf States generate their own development from oil revenues which have been responsible for the recent and rapid industrialisation of the predominantly rural Arabian Peninsula.

These development patterns have determined the type of projects made available in the construction field. Countries such as the Gulf States, for example, need to balance building development (e.g. houses, schools, clinics, hospitals) with civil engineering projects such as sewage, water distribution. A limited land mass and small population requires careful planning for short to medium term development. Rich, large countries, such as Saudi Arabia, require a greater civil engineering programme, with a medium to long term strategy. Those countries without the necessary financial resources have to drain investments from elsewhere, and much of their development potential reflects this situation.

The range of projects being carried out in

The Kuwait Towers.

Photo: Mokhless al-Hariri.

various parts of the region can be divided into those which are basic to the industrialisation policies of the rich oil states, and those which have buoyant economic demands. Projects in the former group include port developments, airport construction, industrial and agricultural development and road infra-structure. Projects in the latter group include the continuing requirements for housing and urban development, health and education requirements, tourism, leisure and recreational facilities.

Some 55-60 per cent of capital expenditure in the Middle East has been spent on construction, a proportion unprecedented in the developing world. Some seven years ago expenditure on construction in all the major countries in the Middle East amounted to some $23.5 billion and there are indications that the market will continue to expand, at least in the immediate future. Therefore, the Arabian Peninsula is expected to enjoy a faster rate of growth at least over the next five years than the rest of the world as a whole.

Once the basic infra-structure is completed (and there are still many projects recently awarded or under construction in this field), there will be only a limited number of multi-million dollar projects to be handed out. However, public spending is still showing strong emphasis on the development of better infra-structure, improved urban facilities and the provision of adequate housing accommodation. Enormous construction opportunities exist for a wide range of projects, from road improvements to the building of completely new communities. In the housing field there is a particular need to provide accommodation. This, together with the accelerating price of land, has encouraged the development of high rise buildings and other cost-effective units, such as prefabricated buildings.

The various countries sharing the Gulf Sea have undertaken over a period of two decades a huge development programme comparable in scale to one hundred years of industrialisation in advanced nations such as Britain. For example, investment has amounted to $40 million per kilometre of coastal strip on the Arabian side (in the case of Saudi Arabia, this figure soars to $100 million). Rapid development has transformed an essentially rural economy with a small population into the fastest growing indus-

Table 1 **Oil Rich Countries in the Arabian Peninsula**

Country	Per Capita GNP (US$)	Current Population		Average Density (per sq. km.)	Population Growth Rate (%)		Estimated Population 2000 (millions)
		Total (millions)	Urban (% of Total)		Total Country	Urban	
Oil Rich Countries							
Kuwait	19,830	1.67	88.4	71.0	6.0	7.4	2.7
UAE	26,850	1.08	71.9	10.9	13.2	15.5	1.4
Qatar	26,080	0.25	86.1	20.5	7.2	7.9	0.4
Saudi Arabia	11,260	8.4	66.9	4.0	4.4	7.6	15.2
Bahrain	10,684	0.4	78.3	—	6.9	6.8	1.2
Oman	4,380	0.9	20.0	2.9	3.1	16.8	1.5
Average	16,514	2.22	68.6	124.1	6.8	10.3	4.0
Yemen Arab Repubic	430	7.0	10.3	35.0	2.9	8.3	11.0
Yemen PDR	420	1.9	36.9	5.6	2.4	3.8	3.1
Total Population		21.6					36.5
Total Average	12,492	2.78	57.35	104.5	5.7	9.2	4.5

Source: World Bank: Social Indicators: August 1982 *and estimates up-dated from other technical reports (Washington, D.C., 1982).*

trial region in the world. No less than twenty industrial centres are in operation or in various stages of planning, including in Bahrain the most prestigious dry dock for super-tankers built outside the west and at Jubail one of the world's largest industrial complexes, while Dubai is striving to become "the Singapore of the Gulf". According to the United Nations, all investment in industry, infra-structure and social facilities along the entire coast west of Hormuz will be over $80 billion. Undoubtedly such explosions of development are likely to produce many environmental problems.

Population Growth

It is estimated that there are some 700 to 800 million Muslims in the world, some 140 million of whom live in North Africa and the Asian Middle East, while only 21.6 million live in the Arabian Peninsula (Table 1). The impact of development on population growth differs substantially from the oil rich states to the Yemen Arab Republic and Yemen PDR which face problems relating to basic needs common to all developing countries.

Throughout the region, the population is growing rapidly: while birth rates are high (3.5 to 5 per cent annually), death rates are declining (in some countries by 1 per cent or less) due to improvements in nutrition, medical care, safer drinking water and education. The average growth rate for all countries in the peninsula is 6.7 per cent. In particular, growth rates are much higher in cities, the magnets of migration, including the UAE (15.5 per cent), Qatar (7.9 per cent) and Yemen Arab Republic (8.3 per cent).

Thus the population of many of these countries is expected to double within the next thirty years, while Kuwait's is expected to double in twenty years. At the beginning of this century, the population of the Arab world (including North Africa and the Asian Middle East) is believed to have been about 50 million. By 1975 it had quadrupled and by the year 2000 the total population will have increased to some 255 million. The population of the Arab Peninsula is expected to be 36.5 million (or 14 per cent of the Middle East).

At the turn of the century, one in ten people living in the Arab world as a whole could be classified as urban dwellers. According to the United Nations, by 1970 this ratio had risen to an average of 37 per cent, and, today, to 40 per cent. By 1985 it is estimated that 45 per cent of the population will be living in urban centres, and by the end of the century, about half. According to the United Nations, the rate of urban population growth in the whole Gulf region (including Iran), for example, is nearly half a million annually, requiring almost 100,000 additional dwelling units (corresponding to an annual increase of 91 sq. km. of prepared urban land, with roads, water supply, drainage and other services).

The Arabian Peninsular States

Kuwait (including Bubiyan and the Warba Islands), situated at the head of the Gulf, with Saudi Arabia to the west and Iraq to the north, covers an area of 17,818 sq. km. — slightly larger than Wales. It is mainly flat desert with limited rainfall. Less than eight per cent of this area is used for agricultural purposes, although only one per cent is actually cultivated. Agricultural development is limited by a lack of water, infertile soil and excessive summer heat, consequently most food is imported at a tremendous cost.

The current population is estimated at 1.67 million of which 88.4 per cent are considered urban with an average density of 71 persons per sq. km. According to the World Bank, by the year 2000 the population of Kuwait is expected to be 2.7 million. The population of Kuwait has been growing 7.4 per cent per year. This fast rate is due to a combination of high rates of natural increase (crude birth and death rates are estimated at 39.4 and 4.6 per thousand respectively), and high levels of immigration from abroad. Between 1957 and 1980 Kuwaitis as a proportion of the total population declined from 56.6 per cent to 41.5 per cent. The Planning Ministry estimates that by 1985, the figure will have fallen to 35.3 per cent.

Between 1975 and 1980, the Kuwaiti population increased by only 19 per cent compared to 51 per cent by expatriates. Based on these rates, by the year 2000, the population of Kuwaitis will drop to less than 25 per cent. The current Five-Year Development Plan (1982-1986) concentrates on the establishment of petrochemicals, technical education for Kuwaitis and a steady development in infrastructure with a continuing dependence on imported labour (Kuwaitis make up about 30 per cent of the total work-force). The government is concentrating on capital intensive oil-based industries with small labour requirements.

Oil provides some 95 per cent of the government's revenues and 90 per cent of export earnings. At current rates of production there are enough oil reserves to last for some 150 years. However, Kuwait is already making plans for its post-oil era. A reserve fund for future generations has been set up which is not to be drawn until the year 2001. At least 10 per cent (28 per cent until the recent fall in oil prices) of the government's revenues is set aside for this fund.

In addition to setting aside large funds for alternative sources of power, such as solar energy and natural gas, the government is investing in industries other than the petrochemical sector, including manufacturing, cement, chlorine and salt.

The government remains in control of large, long term industries, such as petrochemicals, refineries, fertilisers and desalination plants. There are also plans for future developments, including expansion of the power distribution network. The private sector is active in the production of building materials, fittings and furnishings.

The National Housing Authority (NHA) which has in the past eliminated nomadic shanty dwellings and has built nearly 10,000 homes suitable for the Bedouin, has now undertaken a programme to deal with the current waiting list. Some 28,000 Kuwaiti families are on the housing waiting list and this number grows by 11,000 a year — in spite of the fact that NHA has already provided for some 142,000 Kuwaitis. In the current plan NHA intends to build 36,400 homes (for Kuwaitis only) at a total cost of $3,032 million to solve the housing shortage for 280,000 people. The plan provides 7,952 villas and 3,319 apartments as middle-income homes and 24,255 villas and 874 apartments as low-income homes. The plan includes improvements in size, style, finish and variety in design of housing units. One such improvement is the provision of gardens, with more privacy and play areas for children. A low-income house (without air conditioning) is increased to 500 sq. m., including three reception rooms. The NHA wants to complete all its projects by 1986 and thus to eliminate the waiting list.

New building regulations require a high level of thermal insulation (resulting in substantial effort in the manufacture of insulation building panels). Middle-income Kuwaitis also have the option of receiving serviced building plots with an interest free loan of $126,000. Non-Kuwaitis on the other hand rely on the private sector for housing; available to them are imaginative luxury schemes in the urban centre at high rents. The government is showing concern for the acute housing shortage and aims to co-ordinate an overall housing policy through the Higher Housing Council.

Over the last 25 years, continuing growth and development have more than doubled the urban areas of Kuwait. Kuwait City, the country's main urban centre with 250,000 people has most of its basic infra-structure complete. Other main towns are Hawalli, with 150,000 inhabitants, Salmiya with 120,000, Farawaniya, with 55,000 and Abraq Khitan, with 50,000 people. Shuwaikhh and Shuaiba are important ports set for further expansion. Kuwait City is expected to accommodate 1.75 million people by the year 2000. There are also plans to improve the quality of life for the inhabitants by introducing a green belt and implementing beautification schemes, including street paving and urban landscaping. Modern Kuwait is destined to become one of the most pleasant cities in the region.

There are also conservation studies dealing with the Suq district and Behbehani area, part of the Sharq sea front and the museums at Dasman and Qibla. Kuwait has sponsored some of the best architecture in the Middle East and has promoted imaginative urban schemes such as Safat Square and Derwazet Abdel-Razzaq, separating pedestrians from vehicular traffic, both designed by the Finnish consultants Devecon. There

are also two major traffic schemes which are estimated to have cost some $1,000 million: the loop motorway around the centre of Kuwait and the extensive Mirgab transport centre. The latter is a nine-storey building with parking facilities for more than 5,000 cars, an encouragement to drivers to leave their cars and take advantage of public transport, taxi and pedestrian access to the centre. In addition there are sports facilities, a health club, as well as restaurants, a bowling alley, a hall for cultural events and exhibitions, and conference centre.

In the luxury hotel sector (which relies almost entirely on business visits), there is now a serious over capacity with rooms available without reservation for most of the year. Because Kuwait hosts neither international fairs nor larger state occasions, hotels rely solely on business travellers and they can be empty for some time followed by only short periods of full occupancy.

Subject to the updating of the Kuwait master plan by British Consultants Colin Buchanan and Partners, new growth areas are being proposed. Fintas is located some 20 km south of the city centre along the coast line and Subiya is some 80 km by road to the north. The wider population to be served by the Fintas centre has been estimated at 500,000 by the year 2000. The other growth area, Subiya, is designed within an area of 20,000 ha. Of this, about 14,000 ha. would be required for the urban area and associated open space for a city of 500,000 people by the end of the century.

In the consultancy field, international firms still dominate, but the market is increasingly shared with local firms. One reason for this increase is due to the fact that the Kuwait Municipality requires local consultants or architects to sign plans and drawings in order to issue a building licence. This ruling applies even when international consultants are appointed by the government. Moreover, Kuwaiti consulting offices are receiving priority in government contracts and the Planning Ministry Committee is considering recommendations which will leave the decision as to whether foreign consultants are required in the hands of local firms. Combining local consultants with prestigious international architectural firms has been successful in the past and has provided Kuwait with some of the best of modern architecture in the region.

Most local contractors are members of important merchant families and their bids are solicited by appeal to the prestige not the profit of the project. In contrast, foreign contractors stand to gain only from the price of contracts. Kuwaitis have also been able to make large sums of money on the stock exchange though this has been somewhat moderated since its 1982 collapse. In general this has allowed them to spread their business interests into various sources of profit. Consequently, prestige is often more important than making money from contracts. Moreover, the Municipality's reduction of advanced payment from 10 per cent of contract value to 5 per cent favours local contractors who can react more quickly to mobilisation needs than foreign contractors. Local contractors therefore, have considerable advantages over foreign contractors and have also cornered the private sector. Indeed they are becoming serious competition in neighbouring states for construction works.

Foreign contractors on the other hand have the advantage over local firms in their ability to solve highly technical problems and provide managerial skills. They are thus able to provide keen competition in bidding for complex high-technology projects. This competition does not only come from Europe and the United States. The Japanese and South Koreans offer competitive prices. A successful combination is, therefore, to be found in joint ventures, which bring together the resources of international foreign contractors with their specialised skills and local, long established firms with their intimate knowledge of the market. Local agents are crucial to the success of foreign contractors in assigning new contracts and carrying out work efficiently in terms of labour, procurements and bureaucratic procedures.

Saudi Arabia covers an area of about 2.15 million sq. km. but only 0.25 per cent of the land is under cultivation which is about a third of the 2 million hectares the government believes can be farmed. The first full census was carried out only a decade ago. In 1974 Saudi Arabia had a population of 7 million. It is now officially estimated at 8.4 million (May 1982), of which about 70 per cent is considered urban. The urban growth rate is estimated at 7.6 per cent per year, with an overall growth rate of 4.4 per cent per year. The World Bank has estimated that by the end of the century, the population is expected to reach 15 million.

Saudi Arabia has enough oil for 60 more years and the fifth largest gas reserves in the world. The government is investing in a programme to collect and process natural gas at an estimated cost of $18 billion. There are also significant deposits of uranium, zinc and gold and silver. With a per capita GNP currently estimated at $11,260, a major proportion of the Kingdom's extraordinary wealth has been concentrated in large industrial projects, including oil refineries, petrochemical plants and steel mills. The intensive industrialisation programme has created a lucrative market for the supply and installation of almost every type of equipment and related service.

A third of the country's visible imports (totalling $35.2 billion) comes from the USA and Japan, while Western Europe, mainly Germany, UK, France and Italy, account for another third. In addition to the basic industrial policy, there are also extensive programmes for large infrastructure projects such as irrigation, flood control and the construction of dams and reservoirs. Some 23 dams have been built in the last five years and 10 more are under construction. However, lack of water still remains a major problem. In the current plan, some $16 billion have

been set aside for exploitation of water resources. A further 250 million gallons per day will be added by means of desalination, making a total of 600 million gallons per day. The new plan will also allocate funds to reduce the 50 per cent loss of water through evaporation and leakage in irrigation.

The Kingdom's first and second development plans were based on a balanced growth strategy, with large capital outlays allocated to infra-structure projects. At least two-thirds of national income has been invested in building projects or state industry and on assets held abroad. Both plans are now regarded as being highly successful. In particular, port congestion was eliminated and gross domestic product growth averaged more than 10 per cent per annum. The current third plan (1980-1985) reduces expenditure on infra-structure and concentrates on manpower training, investment in industrial production and improving the quality of life in the small communities. Excluding defence and foreign aid, the new budget is estimated at $235 billion, which compares with the second plan at $149,500 million.

In the first two plans, the impact of development was concentrated in the cities. So was much of the benefit. The bulk of Saudi wealth is concentrated in Jeddah, where there is a strong tradition of trade and commerce, in the small but rapidly growing cities of the Eastern province, and in Riyadh, the seat of the Royal Family, from where disbursements are made. However, one third of the country's population remains in the rural areas where living conditions are still simple and the average per capita incomes remain low. Despite the Kingdom's vast oil wealth, poverty still exists in the rural areas of the country. Only 65 per cent of the rural population (as compared with 97 per cent in urban areas) have access to safe water. Similarly, only 35 per cent of the rural population has access to excreta disposal, compared to 91 per cent in urban areas.

Table 2 **Major Urban Centres in Saudi Arabia: Estimated Populations**

City	Population (000)		
	1974*	Estimated 1982**	% of Total Saudi
Riyadh	666.8	1,000	12
Jeddah	561.1	1,200	14
Mecca	366.8	599	7
Damman/Al-Khobar	176.6	500	6
Taif	204.8	300	3.5
Medina	198.2	340	4
Al-Hofuf	102.2	150	1.7
Tabuk	74.8	120	1.4
Buraidah	69.9	130	1.5
Al-Mubarraz	54.3	80	1
Khamis Mishait	49.6	80	1
Najran	47.5	70	0.8
Abha	30.1	45	0.5

Sources: **From the 1974 census*
***Estimated using World Bank current growth rates and other technical reports.*

Small towns, villages and oases, scattered over many parts of the Kingdom, rely mainly on the cultivation of date palm gardens for their livelihood. In the Asir mountains of the south-west, there are more densely populated settlements with fortified buildings. There are also some half million or so Bedouin who still rely on the desert pastures for their animals. They maintain a close relationship with settlements in their areas. These Bedouin are being encouraged to settle and take advantage of health and education facilities and of the conveniences of motor transport and water tanks.

It was in the last 12 years that Saudi Arabia has changed dramatically from a rural to urban society (Table 2), where some 50 per cent of the population now live in fifteen towns with more than 100,000 inhabitants. The major population concentrations are now in Jeddah, Riyadh, Mecca, Medina and the Eastern Province. The Gassim region contains about one million inhabitants (including Buraidah, with 130,000 people). The south-west Asir province contains some 800,000 inhabitants, scattered in more than 4,000 settlements (with Khamis Mushayt containing some 80,000 people and Abha, the regional centre for government spending, accommodating some 40,000 inhabitants). The large conurbations of Jeddah, Riyadh and the Eastern Province boomed during the 1970s, thus draining the smaller towns of valuable manpower resources.

Only 16.2 per cent of the people over 15 years old are literate. In a large country such as Saudi Arabia, with scattered small communities in a harsh environment there are many problems in providing education and health facilities. However, the Kingdom is heavily committed to providing such services free. The current development plan has allocated $35,176 million to education alone (about 16 per cent of the total expenditure).

Strong emphasis is being given in the current plan to the problems of population in the Kingdom. The government is now acutely aware of the need to improve the quality of life in the more remote areas, and some 8.7 per cent of the five-year budget is being allocated for this purpose, with strong committment to regional development. Over $20 billion has been allocated to efforts to minimise the rural drift to the cities by stimulating

regional development and possibly agricultural industries.

Power is now increasingly channelled to the provinces through the Majlis al-Shura (National Consultative Council) thus encouraging the establishment of projects for basic services such as water and sanitation even in the most remote settlements. The Real Estate Fund is spending nearly $13 billion on housing construction, equivalent to about 500,000 dwellings. The Ministry of Public Works and Housing is also concentrating on low-income housing in the rural areas. These policies are likely to continue in the provinces with increasing impetus throughout the 1980s.

However, major cities continue to spend large amounts of money for services and improvements. Jeddah, for example, is spending $600 million on road construction during 1982-3 and there are also allocations for drainage, shore protection, municipal buildings and for planting 300,000 trees as part of a beautification programme. The government is also developing a number of new settlements including Sunrise City, located in the Eastern province between Dharan and Damman, which is planned to accommodate the office of the provincial administration. King Khaled Military City, close to the Iraqi border, has already cost $1 billion in infra-structure and is expected to grow to a population of 70,000.

The government's heaviest committment is to the development of two of the world's largest industrial complexes at Jubail and Yanbu (some 7,000 contractors have been pre-qualified for this work). As recently as 1978, the existing settlements contained 7,000 and 20,000 inhabitants respectively. By the year 2000 Jubail, located some 80 km from the Al-Khobar-Damman-Dhahran triangle, is expected to grow to a population of 270,000, covering an area of 900 sq. km., while Yanbu, some 350 km north of Jeddah is planned for a population of 150,000 over an area of 150 sq. km. Infra-structure for both these cities is expected to be complete during the period encompassed in the current development plan.

Saudi Arabia is also responsible for organising the vast migration of the Hajj (pilgrimage) into the holy cities of Mecca and Medina, involving over two million people each year. The Hajj takes place within about six weeks thus requiring large facilities to process the arriving pilgrims and to provide them with transport and accommodation. Until the end of World War II, a pilgrimage of 50,000 would have been considered large. Today, cheap charter flights, a large mobile immigrant work-force living in Saudi Arabia, improved road connections, increasing prosperity in the Muslim world and the growth of motorised transport encourage more and more of the faithful to participate in the Hajj. The majority of pilgrims are Saudis, whose numbers are increasing by some two per cent each year, while Hajjis who are immigrant workers, taking advantage of their proximity to the holy places, are increasing by some 18 per cent per annum. In 1982, these two groups together amounted to over 1.1 million and outnumbered the 900,000 pilgrims from abroad.

With a labour force of 3 million people the ratio between nationals and expatriates is currently estimated as 1:3. There are some 600,000 Yemenis, having the easiest access to Saudi Arabia, and constituting the largest pool of legally mobile labour. There are also 250,000 Egyptians and 200,000 Pakistanis. The Lebanese number slightly less than 200,000, while there are also 80,000 Palestinians. South Koreans and Philippinos also number 80,000 each (the latter having doubled in two years). In addition there are about 35,000 Americans and 25,000 British. A major focus of the third plan is on the reduction of expatriate labour from 7 per cent to 1.2 per cent annual growth. The planning minister has expressed the wish to halve the number of aliens in the work-force. However, realistic estimates suggest that it will take some twenty to thirty years for Saudi nationals to take over the labour force.

The construction industry accounted for over 10 per cent of GDP for most of the 1970s. As this construction boom begins to deflate at the beginning of the 1980s, the Saudi Arabian market is still larger than those in other parts of the region. With every ministry in the Kingdom involved in construction, the market is likely to remain important to both consultants and contractors well into the 1990s. Some 60 per cent of all construction opportunities are linked with defence projects, requiring a high standard of workmanship. There are also extensive school and hospital building programmes, urban development schemes and beautification projects, sports and leisure centres as well as opportunities for the provision of utilities of public services for towns and villages. They, in turn, create new markets for materials and equipments, with operation and maintenance services becoming an important extension of construction services. However, although high-level skilled labour will be needed from abroad, competition for work is high, with heavy pressure on prices and profit margins.

All public contracts go through a Saudi agent or partner. Before awarding a contract, first priority is given to local contractors. Where a foreign firm wins a contract, the client is keen to see subcontracting work go to Saudi firms. A third of the 1,170 factories are involved in the production of construction materials. Moreover, the government assists local contractors in competing with foreign firms by breaking down projects into manageable components.

The government is now committed to awarding road and bridge contracts to Saudi contractors. Far Eastern contractors have the overall advantage of cheap labour and are still able to bid successfully for contracts in housing and building projects. In particular, South Koreans are successful in low technology, having some 20 per cent of the market share though

they have been losing ground to other contractors having a local base and access to low cost Asian labour.

Since personal contact is essential in the construction market, European firms have an advantage over North American companies, because they have a longer history of cultural and political investment in the area. Whereas US contractors undertake extensive construction management projects, they only carry out a small proportion of the total work involved with their own labour force. In contrast, European firms tend to bid for short-tender contracts and are willing to take part in joint ventures with local partners and sub-contracting arrangements, thus aiming for a long-term commitment by ploughing back profits into the construction industry.

West Germany has a large share of the market taken by European contractors and is involved in some 20 per cent of all construction work in Saudi Arabia. The proportion is likely to increase as more high technology projects come on to market. West German contractors are noted for high quality prestige buildings, while French contractors have been successful in health and education projects. UK contractors have only a relatively small share of the market and tend to sub-contract specialist work.

Outside of high-technology projects, a contractor remains competitive in Saudi Arabia by being the lowest biddder. This is achieved by undertaking turnkey contracts and careful sub-contracting. The changing construction market is also favouring a movement on the part of local contractors to form joint venture companies. Increasingly, local shareholders are buying their joint ventures outright and are taking on contracts previously handled by western contractors.

Bahrain consists of a group of 33 islands off the Arabian coast, with a total area of 622 sq. km. The GNP per capita is $5,560 while the population is currently estimated at 400,000, with an annual growth rate of 6.8 per cent (this is higher than the rate of natural increase due to immigration). Over half the people live in Manama, the capital of Bahrain Island, and Muharraq, another island linked to Bahrain by a causeway. The people are largely Arab Muslims composed of Sunnis (the ruling group) and Shiis who constitute more than half the population. About 75 per cent are Bahraini, and the rest expatriates. Expatriate Arabs are mainly from Oman (1,400), Egypt (1,200), Yemen PDR (1,100), YAR (1,100), as well as Jordan, Sudan, Iraq, Syria and Lebanon. Asians are estimated at about 16,000 and Europeans about 4,000.

Although oil was discovered in Bahrain as early as 1932, the state is a small producer compared to its neighbours. Current output is now averaging 45,276 b/d with an expected 5 per cent decline of production; it is likely to cease by the year 2000. Some 75 per cent of the government's revenue is derived from oil, but this accounts for only 25 per cent of the GDP, while banking accounts for as much as 10 per cent. Bahrain has already changed from being a modest oil producer to being the Gulf's financial centre. It is also becoming a centre for Gulf industrial co-operation projects. A new diversified economy aims to reduce the impact of the slump in the oil market. With this new role in mind, a four-year economic and social development programme has been formulated, covering the period from 1982-1985. Fifty years of oil production have helped Bahrain to establish a highly developed system of social services including health, education and housing. In fact, the state, through the Ministry of Housing established in 1975, provides a considerable amount of low-cost housing for its citizens, notably in the new Isa Town, now housing more than 8,000 people. The government has established a national housing programme and the Ministry of Housing (which also handles related issues such as physical planning and map making) provides Bahraini families with adequate housing. Some 75 per cent of all Bahraini families qualify for Ministry of Housing assistance.

At present 1,800 dwelling units are realised every year; that is equivalent to one house for every 22 Bahraini families. The current programme includes two new housing areas at Sanabis and Umm al-Hassan and there are plans for a new town, Hamad, recently announced to house a total population of 100,000. Some 30 local contractors participate in the Ministry of Housing programme using modified traditional building methods. The government encourages local contractors to participate in the new phase of development by breaking down contracts to suit management capability. Housing alone will account for 500 million.

Economic activity is beginning to increase during this plan period, as a result of Saudi Arabia, Kuwait and the UAE's aid to Gulf projects, together with Bahrain's own economic stability. The new four-year programme aims to spend some $3,045 million. There are also schemes to be carried out amounting to a further $1,000 million, 75 per cent of which is to be funded externally. These include petrochemical plants and the causeway now under construction between Bahrain and Saudi Arabia. Part of the first seven embankments has already been laid, connecting Bahrain with Umm al-Hassan Island. Designed by Saudi Danish Consultants, the causeway is expected to be operational by 1986 and will allow Bahrain access to a wide range of projects in the Peninsula. Some $345 million is also being spent on water projects. Water is being depleted even faster than oil and Bahrain has now undertaken a costly desalination plant construction programme to meet demand. Capacity is being increased tenfold from 5 million gallons to fifty. Other important schemes are the development of the Gulf University and the Bahrain International Airport.

Bahrain remains a highly competitive market and profit margins rarely exceed 10 per cent. However, project spending is

rising by more than 50 per cent, particularly in the provision of infra-structure. The next three years are likely to offer renewed opportunities in the public and private sectors for contractors able to compete in price and quality of work. Local contractors, encouraged by the government are likely to take a larger share of the market, although some of the projects will require international skills and expertise.

Qatar is a peninsula of about 11,000 sq. km. of which only a very small proportion is used for agricultural purposes (less than one per cent). The population is estimated at 250,000, of which only 70,000 are believed to be Qataris. The capital, Doha, accommodates some 190,000 people. By the end of the century, the population is likely to increase to 450,000, of which about a third will probably be Qataris.

About 20 per cent of the labour force totalling 66,000 people consists of Qataris, the remaining being immigrants. Of these, 15,000 are Arabs and there is also a large proportion from Asia. The government is concerned with the disproportionate number of foreign workers and attempts are being made to limit the number of expatriates and where possible to create labour agreements through the Arab Labour Organisation. Such agreements already exist with Morocco, Tunisia, Egypt and the Sudan. Much of the Qatar's foreign labour has been there for years and the sponsorship law passed in 1981 makes it extremely difficult to change from one employer to another.

The current oil production is at 300,000 b/d, generating most of the country's income. In addition, huge off-shore gas resources have been discovered at North West Dome which are considered to be one of the world's largest, with reserves estimated at a minimum of 2038.81 billion cu. m. This is a new potential boost to Qatar's future development, where current oil reserves are not expected to last longer than the year 2010.

A detailed study of development opportunities was initiated, and a plan was drawn up and approved by the end of 1973. The plan has provided important guidelines as to how the country would develop into the 1990s. It emphasised the need for acceleration in residential construction and paid special attention to planned growth for Doha as well as to new industrial projects and the development of light industries. With many major industrial projects in place, the government was able to concentrate on social development schemes to meet the needs of Qataris. Doha has been developed on a well-planned basis over the last five years. Dramatic changes are in evidence particularly on the large extension being built in the West Bay area which includes hotels, luxury villas and medium-cost housing as well as embassies. This extension is the natural region for expansion, financed as it is directly by the Amir's Technical Office; it has enormous potential for promoting future projects.

The industrial centre of Umm Said, 40 km south of Doha, is also being developed. In 1981, the huge natural gas processing and petrochemical complex at Umm Said was formally inaugurated and there are opportunities for major expansion during the 1980s.

Further industrial expansion is also being planned at Salwa industrial estate. The present policy, however, is to promote small to medium-size manufacturing ventures. So far, 20 projects to establish industrial concerns have been approved and financing 40 per cent of the total capital outlay has been secured.

In 1981, British consultants, Shankland Cox, produced a master plan for Doha, predicting growth patterns for the state as a whole, until the year 2000. Thus Qatar has emerged from a decade of rapid growth into a new period of stable development. The Amir's approach now is to concentrate on infra-structural and self-supporting diversification. Particular emphasis is given to projects already committed for development.

Urban and infra-structural planning are being based on a possible increase of population to 450,000 by the end of the century. The Ministry of Education, one of the largest spenders in the state, was allocated in the 1982-3 budget a total of $451 million. Qatar's 150 existing schools are expected to double by 1990 and expensive sport facilities are due to be awarded in the future, including Olympic-size swimming pools, sports halls and athletic tracks. During 1983, the new Qatar University is expected to admit 3,000 students (with a second phase already being planned). Other proposed urban schemes include seveal large sports clubs, new parks and other leisure and recreational facilities.

A network of more than 900 km of good roads provides a ring-road system at the capital and links Doha and Ruwais in the north, Dukhan, Umm Said and the frontier at Salwah. Qatar is now part of a continuous land connection with Europe. Many of Qatar's imports arrive at Jebel Ali in Dubai and are brought into the capital overland. New infra-structure projects include the further development of the cement plan at Umm Bab (with a current capacity of 750 tonnes a day, accounting for 50 per cent of domestic needs) which is to receive planned expansion to produce 1,500 tonnes per day by 1987. This area also contains substantial gypsum, limestone and clay deposits for future developments. A new desalination plant is also proposed, at a cost of $1.1 billion for development in three phases.

As in all parts of the Gulf region, successful contractors have to be competitive. South Koreans and Indians, together with local contractors, create keen competition. Local contractors, with low overheads are gaining confidence at bidding at the right place. Foreign contractors are still preferred for high quality work, but they face problems in producing the volume of work required especially in view of the difficulty they experience in obtaining the right work-force, as a result of labour restrictions and

bureaucratic delays in obtaining block visas.

The United Arab Emirates (UAE) which consists of Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al-Quwain, Ras Al-Khaimah and Fujairah, lies south and east of Qatar. About the size of Scotland, it is one of the richest countries in the world. The Federation was founded in 1971, when the British withdrew from the Gulf and immigration control and postal services were integrated at an early stage. Progress has also been made in "federalising" foreign affairs, justice, communications, health and education. The development of public utilities, housing, agriculture and roads in the smaller emirates receives assistance from the federal government. However, economic strategy still seems to lack co-ordination. The UAE also has its own army, the Union Defence Force (UDF), formed from the former Trucial Oman Scouts (although several states maintain their own private armies not under the UDF's command).

In December, 1980, a national census was carried out to assist the formulation of the forthcoming five-year plan. The number of people estimated to be living in UAE has grown from 180,000 (1968) to 557,000 (1975) and finally to one million in 1980. The Ministry of Planning has estimated that the UAE labour force has increased from 288,000 (1975) to 538,000 (1980). Immigrant employees form a large proportion of the population (up to 75 per cent has been suggested). They are mainly Indo-Pakistanis but also include substantial numbers of Arabs, Iranians, Europeans and Americans. Last year a law was passed, designated to clamp down on work permit abuses. It also ensures repatriation of labourers after the completion of a project.

With oil production now at 600,000 b/d the Emirates are going through a period of reduced revenue, but without cutting back on priority development schemes. For example, in the oil production and exploration and hydrocarbon related industries, there are 56 projects already in hand and there is a budget of $600 million to cover the period up to 1985. With massive external payment surpluses of $5 billion in 1980 alone, individual projects are unlikely to be held back, although careful selection based on better management is now essential.

The main thrust of spending during the next five years is expected to be in the field of human resource development (e.g. public services, social facilities, higher education). In particular, the UAE University at Al-Ain is a top priority. Another is the supply of services to the small dispersed communities in the desert, including water, electricity and social facilities. Emphasis will also be given to desalination plants, telecommunication related projects and major urban development projects. Systematic planning in Abu Dhabi, Dubai and Sharjah, are equally emphasised.

Abu Dhabi (with a population of 451,000) is the western most of the Emirates, and, with a coast line of 480 km stretching from the base of the Qatar peninsula in the west, to Dubai in the east, it is also the largest. A number of islands off the coast are also part of the state, economically the most important being Das and Abu Dhabi, site of the capital (Abu Dhabi City), just off the mainland to which it is connected by two bridges.

The key factors to human settlement have been the location of traditional water sources and oil wealth, permitting the development of industry and commerce and allowing infra-structure schemes. Today the main areas of importance are Abu Dhabi City (population of 200,000) and its environs as well as Al-Ain with an estimated 75,000 people. Other settlements include Jebel Dhanna on the coast (including the Ruwais area currently being developed for an eventual population of 40,000 to 80,000), Tarir (a small coastal village between Jebel Dhanna, and Abu Dhabi town), settlements related to oil installations in the south, and the Liwa (a collection of villages set around oases now linked to the other centres by road). These settlements have a total population of about 40,000.

Abu Dhabi, with some 85 per cent of UAE spending power, has an extensive programme for public and private construction projects. The Municipality budget on roads alone is $634 million. These include a new elevated road parallel to Salam Street, to carry additional traffic generated by the new *suq*, and roads and promenades along the corniche development, part of $2 billion commercial complex (which includes twelve blocks of 100 apartment buildings and a new luxury hotel).

Abu Dhabi is also implementing a detailed expansion plan, including a 615 km causeway, linking the main island with Sadiyat, Abu Jabel and Fahad.

Other major projects include a housing project on Das island to be completed by 1988, those undertaken by the water and electricity departments and the armed forces, a maintenance depot and associated facilities at Suweihan, Abu Dhabi's new International Airport Nadia, which is phased to double its current capacity of 3 million passengers, and Al-Ain airport to be built over the next four years. An important project for planning consultants is the master plan for Al-Ain to be undertaken during 1983.

Dubai (with a population of 278,500) is the second largest Emirate, to the east of Abu Dhabi, occupying about 70 km of coast line and extending for approximately the same distance. The territory is mainly desert with little vegetation. Most of the population lives in Dubai City, actually composed of twin towns, Dubai and Deira (now the main commercial area), on opposite sides of a 12 km creek. There are substantial numbers of immigrant Arabs, Indians and Pakistanis, Iranians, Europeans and Americans, and it has been estimated that only 20 per cent of the population is indigenous.

The Dubai Municipality budget for 1982 was US$408 million. A master plan is to

be undertaken during 1983 to include the entire urban area, as far as Jebel Ali, (some 50 km from the city). A major area of concern is traffic congestion. There are also considerable prospects for work in redevelopment, particularly in residential areas. Upgrading is also required for government offices, schools, clinics and commercial properties.

Sharjah (with 160,000 inhabitants) is the third largest Emirate and consists of two coastal strips, one about 32 km long between Dubai and Ajman, the other between Ajman and Umm Al-Quwain. In addition, there is the territory in the interior and areas along the east coast of the peninsula, notably around Kalba and Khor Fakkan, separated from each other by territory belonging to Fujairah. The capital, Sharjah City, is 14 km north of Dubai on the west coast and holds some 75 per cent of the state's population. In recent years the importance of Sharjah has declined, partly due to the commercial development of Dubai and partly to the expansion of Abu Dhabi. Many low income UAE residents commute to Dubai, due to Sharjah's lower rents. Recently, however, considerable quantities of gas and light oil have been discovered and land prices are already rising by 20 per cent. This is expected to result in radical changes in Sharjah.

Ras Al-Khaimah (population 74,000), one of the larger Sheikdoms, covers an area of 1,683.5 sq. km. and is the most northerly with a coast line of 65 km. The northernmost section beyond Ras Al-Khaimah town includes the town of Rams and the industrial centre of Khor Khuwair. The native proportion of the population is probably larger than in most Emirates, but a sizeable part of the labour force is Indo-Pakistani. Because of the proximity of the mountains, there is more water than in the other states and there are fairly extensive cultivated tracts of land, and even hot mineral springs at Khatt. Ras Al-Khaimah town, the capital, is part of a twin town, Al-Nakhil, on the other side of the Creek.

Ajman (with 40,000 people) is in an area of 259 sq. km. and consists of Ajman town situated on a small coastal strip (an enclave in western Sharjah), together with some interior territories which possess water and minerals. Ajman still depends to a considerable extent on Federal expenditure for expanding its roads, drainage systems, schools and public services. A regional study has been undertaken for the entire Emirate with proposals to improve the capacities of the whole area, as well as the expansion of the town. These also include housing at Al-Gurf and the development of the central area. Some 80 km of road building is now in progress and low-cost housing at Musherif. A vital project is the provision of a sewerage network.

Umm Al-Quwain (12,300 people) consists of a town of the same name, situated on a small coastal strip about 30 km long and extending inland about 50 km. This Emirate also benefits from the deployment of Federal funds with provisions made for Federal services such as schools, and police and a hospital expansion. A good deal of housing has been built with "dormitory" intensions.

Fujairah (32,000 people) consists of two sizeable main territories, the town of Fujairah itself and, to the north of the mountains, Dibba, both towns being on the coast.

In the rich Emirates competition is keen but the market is small. Abu Dhabi, the largest spender, has over 1,000 firms registered and contracts generally go to the lowest bidder. British companies (well established since the beginning of the Federation) and even South Koreans now face keen competition from local contractors. UAE contractors have various built-in advantages and foreign firms find difficulties in competing. Local contractors (who are already given a 10 per cent advantage over foreign firms on account of tenders) pay only 5 per cent on bid and performance bonds (whereas others pay 10 per cent). They also receive 25 per cent mobilisation costs. Thus, the most advantageous way of gaining work is to enter into joint venture agreements with carefully selected local firms.

Oman, the second largest country in the Arabian peninsula, covers an area of 212,500 sq. km. most of which is desert and mountains. Communities are scattered in this terrain and a small enclave at the tip of the Musandan peninsula is separated from the mainland by the UAE. The coast line, itself, on both the Indian Ocean and the Gulf, extends 1,600 km and runs to the north border of South Yemen. Between the sea and the west Hajar, lies the narrow, but reasonably well–watered and fertile coastal plain of the Batinah. Situated behind Muscat, the capital, is the Jebel Akhdar on which there is rainfall, although Muscat itself receives very little precipitation. On some slopes and foothills of the Hajar, fruit and crops are grown by irrigation. Most of the coast of the Arabian Sea is desert, but Dhofar in the extreme south west receives monsoon rains and provides a third agriculture area.

The total population is currently estimated at almost 900,000 mainly concentrated on the Batinah, in the Hajar valleys around the capital and the southern part of Dhofar. The population is growing at an annual rate of 3.1 percent.

Oil wealth has resulted in a redistribution of population from the interior to the coastal region of the capital zone. The Muscat-Mattrah-Sib area has grown rapidly and is believed to contain some 80,000 people. The population of Dhofar is believed to be about 60,000 and is concentrated in Salalah, in the west. Salalah has been transformed from a large village into a modern town, with many modern facilities in a very short period of time. A major highway project is connecting Nizwa, the old inland capital with Thamarit in Dhofar and with the road over the Qara mountains to Salalah. But the coastal towns and villages between Salalah and the border with

south Yemen, were depopulated during the war, and much effort is still needed to restore the population and economy.

The hinterland population is almost entirely Arab, but in the Muscat-Muttrah area, there are substantial numbers of Indians, Pakistanis and Baluchis, providing skilled workers and professionals, and there are some Europeans (mainly 6,000 British). The Omanis are an indigenous collection of tribes who have inhabited the mountains and desert for thousands of years and generally have a sense of belonging to their country, a point which differentiates Oman from other states in the Gulf.

Some 97 per cent of Oman's revenue comes from oil. The aim is to achieve a steady production of 320,000 b/d over the next five years. The total labour force is estimated at 23,000, including police and military personnel. Of the Gulf states Oman is generally considered to be the least dependent on foreign labour although larger numbers of expatriates were used in the initial phases of development.

Oman is a country with an agricultural tradition, where the people are still mainly employed in the agricultural sector, and where industrialisation did not begin until the early 1970s. Nevertheless, many Omanis have moved to the cities, undertaking jobs in the civil service, or in the security forces of neighbouring countries. Some 38,100 Omanis are believed to be currently working abroad, mainly in Saudi Arabia (about 17,500) and in the UAE (about 14,000), as well as Kuwait, Qatar and Bahrain. But the drift away from the farms is creating difficulties for agricultural production. Once they leave, people do not generally return to their land and attempts are being made (by means of financial and other inducements) at least to persuade those who are still in the rural areas to stay. There is also an endeavour to persuade the land owners to form co-operatives and use modern methods of agriculture to increase production. Similarly attempts are being made to exploit fishing potential mainly of the south shores of Oman from Masirah Island to Kuria Muria Bay where the region is either sparsely populated or uninhabited.

There has been a general rise in the standard of living in Oman and this has led to an increase in domestic water consumption and demands for its expanded distribution. Until recently, the increased demand had to be met by ground water, affecting water available for irrigation purposes. Now this demand is being met by desalination plants, utilising water from the sea. A good deal of housing has also been built, and a new town (Medinat Qaboos) has been developed west of Muscat. Much has already been completed, involving drainage, water supply and sewerage construction. While in 1970, the capital had no modern water supply, it now receives some one billion gallons a year.

An overall budget of $22,100 million has been allocated in the current development plan (1981-1985) with an emphasis on regional development. Priorities are given to the development of agriculture and fisheries, mining and manufacture. A new town is being built in the remote north area for the Sohar copper project to serve the mining community. Similarly, in Dhofar to the south, where the population lives in the 30 km wide coastal strip, the five-year plan has allocated US $1447 million for development. At the foothills of the Jebel Akhdar, the new township of Al-Khodh, with two 1000-home developments is being provided by the Ministry of Social Affairs and Labour.

The Communications Ministry has the biggest budget, amounting to $1 billion to expand the road network, with particular emphasis on regional accessibility. In 1982, a 780 km highway was completed, linking the capital with Salalah in the south. The road building programme has been a considerable achievement in the development of Oman. In 1970, the country had only 10 km of asphalted roads and within ten years this figure was increased to more than 21,000 km. Another major project is the Sultan Qaboos University, estimated to cost some $900 million, which is to be opened by 1986.

Although British consultants and contractors have maintained a prominent position in the construction market there has been some keen competition from Asians and local contractors in recent years. One reason has been the policy of packaging projects into small contracts, thus placing international contractors at a disadvantage when tendering. Local contractors also have the edge because expatriate staff rates tend to be high and generally mobilisation costs are also more expensive for foreign firms.

Yemen PDR covers an area of 333,000 sq. km. of which some 28 per cent are used for agricultural purposes. Arable land, at 405,000 ha. (121,000 ha. under cultivation) is only 1.4 per cent of the total land area. The terrain is largely barren: the temperatures are high and rainfall scanty, except in certain mountainous regions. The present population is believed to be 1,900,000 of which about 37 per cent is considered to be urban. By the year 2000 the population is expected to be about 3.1 million.

Due to migration to neighbouring countries (70,000) the population growth rate (2.4 per cent) is lower than the rate of natural increase. The urban growth rate is 3.8 per cent. The crude birth and death rates per thousand are 46 and 20 respectively. Life expectancy at birth is 45 years. There are some 6000 people for each physician and 756 persons for each hospital bed. Of the total population, only about 24 per cent have access to safe water (30 per cent in urban areas). The total labour force is estimated at 463,200 of which 43 per cent are engaged in agriculture and 15 per cent in industry. Outside Aden agriculture is the main occupation and supports most people.

The most important town is Aden, with an estimated population of about

300,000. It is divided into several townships including Crater, Khormaksar, Ma'alla, Steamer Point, Madinet al-Shoab (formerly, al-Ittihad), Little Aden and Shaikh Othman. The town of Mukalla in the east has an estimated population of 60,000. Until the closure of the Suez Canal in 1967, the port of Aden provided most of the area's revenues and employment. Once the largest harbour between Suez and India, it had a substantial bunking trade. Following the closure of the canal and the withdrawal of the UK base, there was a dramatic decline in traffic and revenues. Before independence, bunking used to account for 33 per cent of total exports; this has since fallen sharply. At the end of 1970, Aden's historic role as a "free port" came to an end when import duties ranging from 3 to 30 per cent were imposed on goods passing through. There is, however, a "free zone" for transit goods and for tourist shopping. The reopening of the Suez Canal raised hopes of greater activity through the port, but the impact has been disappointing.

Future Trends

A number of factors contribute to make it difficult to generalise about future trends in the Gulf region. Population estimates in many countries in the Arab World still remain incomplete and unreliable (although some countries, now have regular censuses). There is a wide variety in the types of nation states ranging from the small city state of Kuwait, to large countries such as Saudi Arabia with complex urban situations. There is also a wide range of definitions for the process of urbanisation (e.g. growth in the number of people in urban areas; growth in the number of centres; the physical extent of urban land; the socio-economic factors contributing to urban life, etc.). Despite these constraints, an attempt is made in this section to examine some trends in the future pattern of growth. We will begin by looking at trends in the construction sector, followed by an assessment of the impact of these trends on manpower and migrant labour. Finally, we shall suggest what effect urbanisation is likely to have on the development of cities in the region.

The market for construction in the Arab Peninsula is changing from rapid development carried out in the 1970s to carefully planned growth emerging in the 1980s. Due to falling oil revenues, money is no longer freely available, resulting in more thoughtful planning, with increasing emphasis on cost-effectiveness. Clients are better informed about their development needs and are showing more interest in the quality of the projects, rather than in the speed of erection. With increasing local participation in the construction sector, more joint ventures are being undertaken with foreign companies, under the control of nationals. Land values are also increasing, thus making redevelopment schemes attractive.

The market for development and international construction is no longer expanding at the extraordinary rate of the last decade. A more modest increase is expected over the next five years, resulting in a levelling out, although still on a very high plateau. Attention has shifted from the installation of basic infra-structure and from ambitious development plans to more socially beneficial schemes, including housing, health and education programmes. The nature of industrial projects has also changed from extravagant duplication of prestige schemes to more complimentary and cost-conscious projects. Contracts in the construction industry are likely to be reduced in size, perhaps within the range of $10 million to $100 million. In many countries large civil engineering projects are being broken down into smaller units as an incentive to local contractors to compete for the work.

Maintenance of public services and infrastructure projects already built in the major population centres during the last decade will also provide lucrative contracts. Although the maintenance industry is still in its infancy, with 60 per cent of construction costs in services such as power, water, drainage and air conditioning, there is obviously great potential in this field.

Local involvement has expanded greatly during the last few years. About 600 local contractors operate in Qatar alone, while Saudi Arabia now has some 5,000 and the number is increasing. One advantage of the new small-scale domestic construction firms is that overheads are low. They thus remain competitive in price compared to foreign contractors, who need to plough back their profits into future work. The advantage given to contractors in the member countries of the Gulf Co-operation Council (GCC) is likely to continue and the formation of partnerships between the different nationals in the region is bound to increase. Such partnerships are treated as local firms when bidding for contracts within the GCC. In particular, housing and road contracts are awarded with preference to local companies. While local contracting firms are gaining in stature and in size, joint ventures, especially in Kuwait, Saudi Arabia and UAE have become a permanent feature. It has become almost mandatory for western contractors to find an Arab partner.

Far Eastern contractors, particularly the South Koreans who are state subsidised, can outbid western contractors by 30 to 40 per cent and still offer acceptable standards to their clients. South Koreans have about 20 per cent of the total market (mainly in Saudi Arabia and the UAE), as compared with the decline of US contractors to less than 2 per cent of the market. Having disciplined labour forces, they are competitive in building roads, sewerage schemes, industrial plants, housing and schools. With backing and subsidies from their government, they are bidding at less than real cost prices. However, in spite of remarkable operating success, South Korean firms

are concerned about the growing number of local construction companies and they are also faced with demands for higher standards of living from their work-force. They have begun employing Far Eastern nationals who can settle for lower wages and have not neglected joint venture opportunities with local contractors.

Other Asian countries having increasing interest in the Arab market because of workers remittances are Indonesia, Thailand, the Philippines, India and Pakistan. Indian contractors have been particularly successful in Kuwait, while Pakistan is well established in the region and Thailand is also keen to secure more projects. Similarly, Indonesia which is now entering the market, has the advantage of being the world's largest Muslim nation. Both Saudi Arabia and Kuwait are committed to giving favourable consideration to bids from developing countries in the Muslim world. On the whole the socio-economic advantages for Arab clients in recruiting labour from developing countries outside the Arab region are likely to increase during the 1980s. The World Bank has estimated that during the decade 1975-85, there is likely to be an increase of 20-30 per cent in the total population of Far Eastern migrants in Arab states.

Western contractors are taking advantage of the demands for their managerial expertise when undertaking large scale projects and seek to combine this with the low operating costs of Asian workers. Such expertise for large projects cannot be under-estimated and involves complex pricing, absorbing legal differences and attitudes in multi-national joint ventures. Careful management is also needed in selecting foreign labour by taking account of wage rates and transport costs, adaptability to the environment, and the level of skills required for the project. However, with increasing insistance and incentives toward the utilisation of local agents, Arab countries are beginning to gradually take over more of the responsibilities for projects, effectively squeezing out foreign firms.

The geographical distribution of projects and development activity in the Arabian Peninsula is also altering. The Saudi Arabian market continues to develop at a steady pace, amounting to more than half of the total market. Currently, some 800 projects are in operation or under consideration (with government accounting for a high proportion of the market). Construction projects are to benefit by some $150 billion during the course of the current development plan. Management and consultancy services in Saudi Arabia are predominantly provided by USA, while major contractors are from Germany, France, Japan and South Korea. Germany and Japan are successful in bidding for high-technology projects. With 80 per cent of the country's exports going to the Middle East, Germany is heavily committed in the region. Japanese success is partly due to the skills provided and partly to financial assistance from the government, particularly in fixed-sum contracts. French contractors are also provided with assistance and support by their government and the nationalised banks.

Although construction activity is declining in the small Gulf states, there are still many large projects under consideration. Kuwait's increased development is likely to continue, concentrating in the private sector, while current major public housing projects are expected to be completed in the next few years. As the influx of immigrants and expatriate labour to Kuwait increases the country's peripheral expansion and the construction of self-contained communities will ensure further commitments to construction. Local contractors are taking an increasing share of the construction market, although foreign contractors have the edge on high technology contracts.

In Bahrain, oil revenues are less limited and while the infra-structure is more or less complete, there is still a need for low-cost housing (although over-building during the boom period has left many expensive villas empty and lavish hotels only half full). The major project is the causeway linking Bahrain and Saudi Arabia, requiring a labour force of some 3,000. The causeway may well give new life to Bahrain, if conditions are appropriate for firms involved in large industrial complexes such as Jubail to establish their headquarters and take advantage of a less austere atmosphere. Another large civil engineering project not likely to be completed before the year 2000 is the drainage and sewerage systems for all inhabited areas of the island. Other new projects for the 1980s include the Gulf University, a tower-block complex east of the capital, prestige commercial buildings and the building of Hamad Town, a self-contained community. Isa Town continues to expand and in less than two years is expected to accommodate some 35,000 people.

In the UAE much of the major infrastructure has already been completed. The industrial cities of Ruwais and Jebel Ali located in Abu Dhabi and Dubai respectively, will be developed throughout the 1980s. During the same period development is expected to take place off the Deira corniche as part of Dubai's expansion plan. In the Northern Emirates, utility services will be developed during this decade. In addition to accommodating a high growth rate, there is a need to replace a large part of the housing stock provided after independence and to ensure better standards of design and construction. Both Abu Dhabi and Dubai have their own building programmes and also assist the Northern Emirates.

In the Yemen Arab Republic, there is currently a lack of skilled manpower. Future expenditure is envisaged in infrastructure, health, education and housing. Various housing studies are being considered to cope with the steady drift to the urban centres, particularly in Sana'a. The Ministry of Municipalities and Housing is organising a large urban development project, planned for 1981 to 1985, costing some 25.5 million (jointly financed by the government and the World Bank). The government is encouraging private invest-

ment in high-standard dwellings for upper income Yemenis, or expatriates, while the World Bank component deals with housing for the low-income groups.

The Impact of Foreign Labour

A useful distinction can be made between the oil-rich countries, such as Saudi Arabia and the Gulf States, with small indigenous populations, and neighbouring Arab countries with large pools of skilled workers. A further distinction should be made in the former group between those states in the northern Gulf, such as Kuwait and Bahrain, which started their development early in the 1950s and those in the lower Gulf area that began their extensive projects in the early 1970s.

The development process demands a substantially unskilled labour force in the early stages, followed by a smaller, but highly skilled work-force once the basic infra-structure has been completed. Thus, respective stages of development, together with geographical factors have had an impact on the characteristics of the work-force imported by each of the oil rich countries. An additional ingredient has been the presence of large numbers of Palestinians in Kuwait, whereas the lower Gulf states such as the UAE relied more heavily on Indians and Pakistanis. Therefore, while the proportion of immigrants in the lower Gulf States has decreased (although in sheer numbers there has been an increase), in the northern Gulf States such as Kuwait, Palestinians and other Arabs constitute a larger proportion of the total.

In order to control the inflow of foreign nationals into the Gulf area, heavy restrictions have been introduced by the oil-rich governments. These include the requirement that all labourers obtain a visa to enter and work into such countries (entry documents are now required even for Yemenis in Saudi Arabia) and the requirement that the sponsoring employer be responsible for his labour force. In addition it is extremely difficult for immigrants to become naturalised citizens and foreigners are often barred from owning property and businesses (even rented accommodation is restricted to certain parts of the cities, as in Kuwait) and are often excluded from high grades in the civil service.

At the same time, there has been serious concern on the part of the Arab labour-exporting countries such as Egypt, Sudan, Syria and Jordan about the loss of their skilled manpower. This has further encouraged the oil-rich states to turn to Asia for their manpower needs, and to develop a more rigid policy of controlling immigration. The advantage to the oil-rich states is that they can draw from an inexhaustible pool of Asian labour. The remittances from Arabs working in the oil-rich states have helped to boost the development plans of the neighbouring less-developed countries. However, the absence of skilled workers in countries such as the Yemen, has contributed to a manpower shortage in implementing these plans, resulting in dramatic increases in land prices, housing and labour costs.

In the oil-rich states, the general levelling out of development and a lesser need for large construction projects imply a reduction in the immigrant labour force. At the same time, the natural increase of population (both, local and migrant) is reaching high levels due to increased health and education standards.

Many Arabs from neighbouring countries such as Egypt, Syria and Jordan are now accompanied by their families, a phenomenon much less common five years ago. Similarly, some 25 per cent of western executives are believed to be accompanied. On the other hand, immigrants from the Yemen and the Sudan show a very high turnover, since they return home to see their families, many to be replaced by others from the same countries. Asian labour is not only cheaper, but also does not entail the relocation of dependents. Consequently, there is less likelihood that they will interfere with the recipient country's social and cultural traditions. Asian contractors, as well as others, include clauses in their contracts committing themselves to the exportation of the labour force once the project is completed.

The alternative to a multi-cultural society (which most Arab countries are anxious to avoid) is to continue training new arrivals from the Far East at the expense of high productivity. Another possible approach is to encourage the development of separate enclaves, not only in the form of communities (such as in the case of Kuwait), but also in the form of separate industrial cities, away from the existing urban centres. For example, the increasing numbers of Asian workers in the oil-rich states are mainly concentrated in work camps located in the new industrial cities of Yanbu and Jubail in Saudi Arabia, Shuaba in Kuwait, Umm Said in Qatar, and at Jebel Ali and Ruwais in the Emirates of Dubai and Abu Dhabi.

The attractiveness of Asian manpower is mainly due to better organised pools of labour, packaged for export from countries such as South Korea with an international expertise in the construction sector. Labour forces provide their own housing. Similarly, food and recreational facilities are brought in by the immigrant work-force (e.g. Philippinos in Jubail). Arab governments also prefer skilled workers who can be employed without their families and who return to their own countries on completion of projects, thus minimising social and political interference with local culture. In short, the labour market remains under the control of the oil-rich Arab States.

Prospects for Urban Growth

The level of urbanisation in the Arab World, as in other areas of the globe, is likely to continue to increase with populations mainly concentrated in a few metropolitan regions. This is likely to

have important consequences for major cities having high population projections. With a limited area of land suitable for expansion, there are strong indications that parts of the Arabian Peninsula could ultimately become as urbanised as western countries.

The rapid pace of urbanisation is one of the most important elements in the modern development of the region. In Kuwait, for example, at least a third of the population live in an urban area of more than 100,000 people. Though the number of small towns (i.e. those with 5,000 to 20,000 inhabitants) has increased, they nevertheless constitute a reduced share of the total country's population. Urban growth is, therefore, overwhelmingly concentrated in the large cities.

To deal with the problems of metropolitan expansion, more efficient policies are required for the large countries and increased co-operation is required between the smaller states. For example, large countries such as Saudi Arabia contain a number of urban sub-systems, while small states in the Gulf are part of a multinational system, whereby national boundaries are not very significant for urbanisation purposes. Urban growth is, therefore, being concentrated along certain areas of communication and future growth is likely to be encouraged along those axes, resulting in elongated metropolitan areas.

The Gulf States, in particular, will require greater co-operation to achieve integration in controlling urban growth along the coastal axis. In spite of an earlier period of competition, some co-operation is already evident (e.g. the establishment of GCC, pollution control in the Gulf, joint industrial co-ordination between Kuwait and Saudi Arabia, the building of the causeway between Bahrain and Saudi Arabia, and the co-operation between UAE and Qatar for exploring oil fields).

Such policies may also reinforce the apparent disparities between rural and urban areas, especially in the availability and distribution of water for agricultural purposes in the rural areas and industrial and domestic use in the urban areas. Due to the harsh environment, rural development is more difficult and expensive, while industrial development is economically more feasible in an urban context, attracting rural labour. Because of migration to urban centres there has also been a significant change in the character of the Arab city, from a place of temporary migration to that of permanent residence. Migrants are likely to continue to be a high percentage of the population in large cities. Serious problems are likely to emerge as a result of the high social aspirations of the rural people and their need to adapt quickly to new urban lifestyles.

Water deficiencies are likely to become more acute, as the process of urbanisation continues. Per capita domestic water consumption is likely to increase from a current average of 150 lpcd to 250 lpcd in the future. Greater emphasis must be put on discovering new sources, more efficient usage and methods of recycling. The need for providing water and other infra-structure services is likely to create a renewed emphasis on utilities in the urban concentrations of the region.

Economical housing solutions are necessary to keep pace with the urbanisation process. This is particularly relevant in the less fortunate Arab countries, such as the Yemen, and increasingly, housing will need to be seen as an integral part of development. So far, outside the oil-rich states, the public sector is only able to provide a fraction of the housing needs for low-income groups. Thus, although inadequate housing is not a new phenomenon in the Middle East, the sheer scale of the problem is causing serious concern to governments and planners.

Many planning authorities in the Arab countries lack the manpower and in some cases, the financial resources to deal with the complex problems of urbanisation. Ultimately it is the role of Arab planners to deal with the many facets of urbanisation in their own countries. Increasingly, Arab planners are involved in urbanisation projects in their own countries. From a practical point of view, this policy should be encouraged as proposals have to be implemented over a long period of time, involving continuous monitoring and maintenance. The urgency of the situation requires a wide network of inventories and records, as well as scientific data to develop practical policies for the future. In view of the wide geographical extent of Arab culture, an international exchange of experience is vital. This is already beginning to take place through the Arab Town Organisation and the Arab Urban Development Institute based in Riyadh. Similarly, the Aga Khan Award for Architecture also attempts to encourage high standards of design. During the 1980s, efforts should be concentrated on establishing an effective system for planning the physical development of urban regions in the Arabian peninsula.

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